Eastern Caribbean Marine Weather Conditions December 14 to December 18, 2019

Craig Setzer, Meteorologist
Setzer Weather LLC
February 24, 2022

Assignment.
Determine the marine weather conditions over the eastern Caribbean Sea during the period between December 14 to the evening of December 17, 2019. This report will outline the area of interest, the data gathered and used, including interpretation of this data, and the author's opinion of weather conditions during the time period for the area of interest.

Area of interest.
The area of interest for this report is defined as the eastern Caribbean Sea from Aruba east to the Leeward Islands and north to the Greater Antilles. This area is bounded by 12.0°N on the south side and 18.5°N on the north side, and 70.0°W on the west side and 61.0°W on the east side.

Weather data.
For this report, weather data was gathered from the Tropical Analysis and Forecast Branch (TAFB) unit of the National Weather Service's National Hurricane Center (NHC), under the agency known as the National Oceanic and Atmospheric Administration (NOAA). Weather data was also gathered from the National Data Buoy Center (NDBC) of NOAA via the National Centers for Environmental Information (NCEI), including ship reports via the NCEI.

Overview of data.
TAFB is responsible for not only creating observational analysis of current weather conditions for their area of responsibility in the Caribbean Sea (figure 1), but also for using the observed weather reports from buoys, ships, land-based stations, and satellite derived parameters including wind, and nearby land based weather radar, as well as computer model output to create marine forecasts. These marine forecasts, issued four times a day, include a synoptic overview, as well as 12 hour forecast windows for winds and seas for specified forecast areas (figure 2).

Figure 1. TAFB areas of forecast responsibility.

Figure 2. TAFB marine zone forecast areas.

Of particular usefulness in this report is the NOAA buoy 42059 located at 15.287°N, 67.477°W or 180 miles south southwest of Ponce, PR (figure 3). This buoy provides near continuous wind and wave information at an update interval of 10 minutes. This buoy, nicknamed "Eastern Caribbean Sea", is representative of wind and sea state in the open eastern Caribbean Sea and will be relied upon heavily for this report.
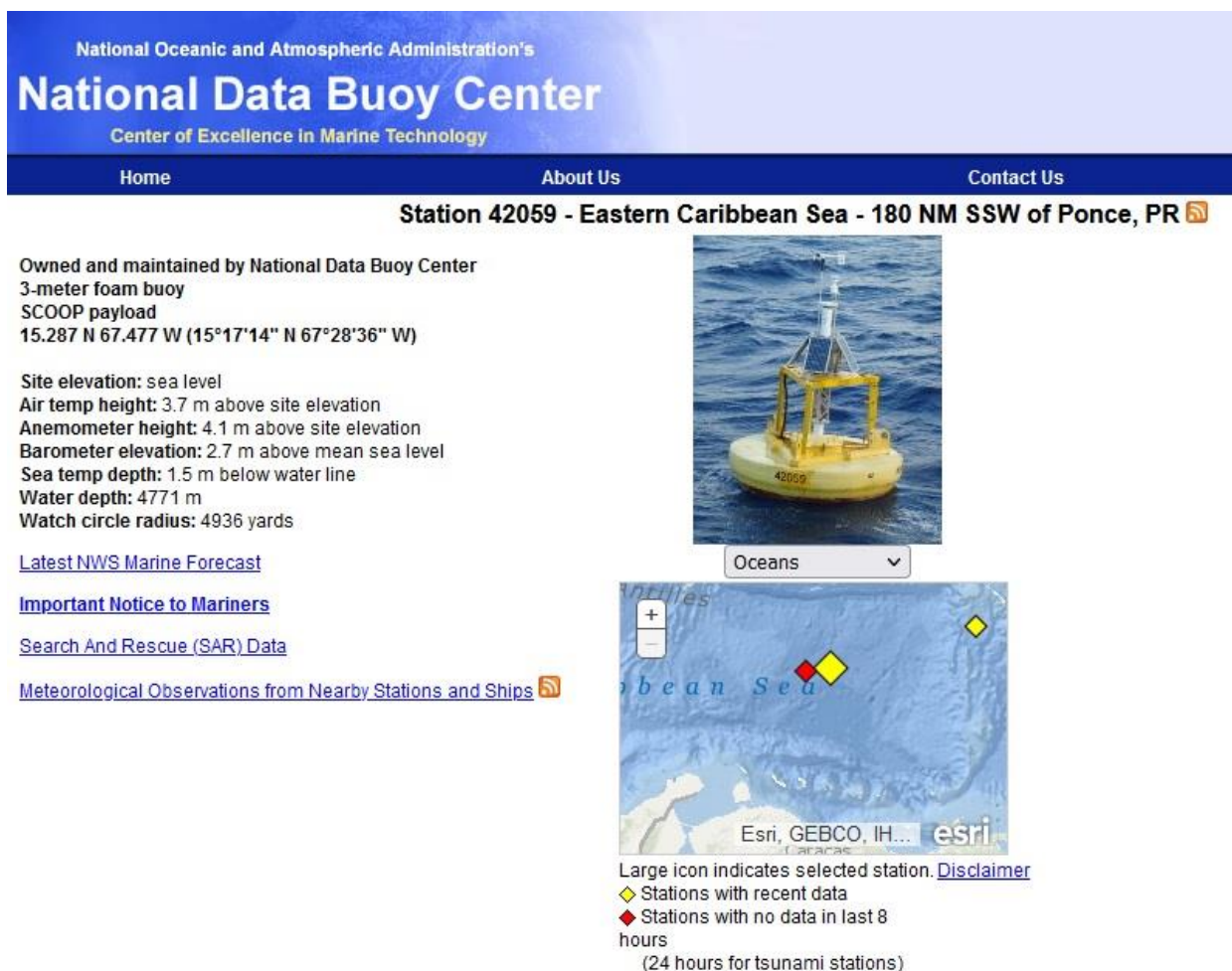

Figure 3. Overview of NOAA buoy 42059 located 180 nautical miles south southwest of Ponce, PR.

Chronology of observed and forecast marine weather conditions.
The High Seas forecast, issued by TAFB, on the afternoon of Saturday, December 14, 2019 (figure 4) included the synopsis message indicating winds and seas would be building Sunday night (December 15) and for several days due to high pressure building to the north.

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FZNT23 KNHC 142043
OFFNT3

Offshore Waters Forecast for the SW and Tropical N Atlantic and
Caribbean Sea
NWS National Hurricane Center Miami, FL
343 PM EST Sat Dec 14 2019

Offshore Waters Forecast for the Tropical N Atlantic from 07N to
22N between 55W and 64W, the SW N Atlantic S of 31N W of 65W
including Bahamas, and the Caribbean Sea.

Seas given as significant wave height, which is the average
height of the highest 1/3 of the waves. Individual waves may be
more than twice the significant wave height.

AMZ001-150845-
Synopsis for Caribbean Sea and Tropical N Atlantic from 07N to
19N between 55W and 64W
343 PM EST Sat Dec 14 2019

.SYNOPSIS...Moderate easterly winds will prevail across the
central and eastern Caribbean through Sun. Winds and seas will
increase east of 80W Sun night through early next week as high
pressure builds north of the area. A strong cold front will reach
the Yucatan Channel Wed afternoon, extend from western Cuba to
the Gulf of Honduras Wed night, then stall and weaken over the
northern Caribbean on Thu.

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Figure 4. TAFB marine weather synopsis for the Caribbean Sea issued Saturday afternoon, December 14, 2019.

This was also indicated in the TAFB forecast, as part of the text message product (figure 5). The narrative marine forecast for the eastern Caribbean called for easterly winds of 15 to 20 knots and seas of 4 to 6 feet over the southern portion (AMZ033) of the area and east winds at 15 knots, seas 4 to 6 feet over the northern portion (AMZ023) for Sunday, December 15. Winds were forecast to increase to 20 knots, especially over the northern portion of the area, and seas were expected to build to 5 to 7 feet. The forecast called for a continued increase of both winds and seas on Monday, December 16, continuing into Tuesday, December 17 with east winds 20 to 25 knots, and seas 6 to 8 feet. The forecast for the northern portion of the area included a northeast component to the wind for Monday, December 16 (MON...NE to E winds 20 to 25 kt. Seas 6 to 8 ft).

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AMZ033-150845-
Caribbean S of 15N between 64W and 72W including Venezuela Basin-
343 PM EST Sat Dec 14 2019

.TONIGHT...E winds 15 to 20 kt. Seas 4 to 6 ft. Scattered
showers.
.SUN...NE to E winds 10 to 15 kt Gulf of Venezuela, and E 15 to
20 kt elsewhere. Seas 4 to 6 ft. Scattered showers and isolated
tstms.
.SUN NIGHT...E winds 15 to 20 kt. Seas 5 to 7 ft. Scattered
showers and isolated tstms.
.MON...E winds 15 to 20 kt. Seas 6 to 8 ft. Scattered showers and
isolated tstms.
.MON NIGHT...E winds 20 kt. Seas 6 to 8 ft.
.TUE...E winds 20 kt. Seas 6 to 8 ft.
.TUE NIGHT...E winds 20 to 25 kt. Seas 6 to 8 ft.
.WED...E winds 20 kt. Seas 6 to 8 ft in N to NE swell.
.WED NIGHT...E winds 20 kt. Seas 6 to 8 ft.
.THU...E winds 15 to 20 kt. Seas 5 to 7 ft.
.THU NIGHT...E winds 15 to 20 kt. Seas 4 to 6 ft.

AMZ023-150845-
Caribbean N of 15N between 64W and 72W-
343 PM EST Sat Dec 14 2019

.TONIGHT...E winds 10 to 15 kt. Seas 4 to 6 ft. Scattered showers
and isolated tstms.
.SUN...E winds 15 kt. Seas 4 to 6 ft. Scattered showers and
isolated tstms.
.SUN NIGHT...E winds 20 kt. Seas 5 to 7 ft. Scattered showers and
isolated tstms.
.MON...NE to E winds 20 to 25 kt. Seas 6 to 8 ft.
.MON NIGHT...E winds 20 to 25 kt. Seas 6 to 8 ft.
.TUE...E winds 20 to 25 kt. Seas 6 to 9 ft in N to NE swell.
.TUE NIGHT...E winds 20 to 25 kt. Seas 6 to 8 ft.
.WED...E winds 15 to 20 kt. Seas 6 to 8 ft in NE swell.
.WED NIGHT...E winds 15 to 20 kt. Seas 5 to 7 ft.
.THU...E winds 15 to 20 kt. Seas 4 to 6 ft.
.THU NIGHT...NE to E winds 15 to 20 kt. Seas 4 to 6 ft.
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Figure 5. TAFB marine zone forecasts for eastern Caribbean Sea issued Saturday afternoon, December 14, 2019.

The TAFB marine forecasts verified well when compared to the observed weather, however due to an expected contribution of wave height from a southbound swell, the wave height forecast was raised to 6 to 9 feet for the Monday, December 16 through Tuesday, December 17 time periods. (Fig. 6).

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AMZ001-170245-
Synopsis for Caribbean Sea and Tropical N Atlantic from 07N to
19N between 55W and 64W
934 AM EST Mon Dec 16 2019

.SYNOPSIS...Fresh to strong trades and building seas E of 80W
will persist through mid-week as the Bermuda High builds N of the
area. Winds will pulse to near gale on tonight near the coast of
Colombia. A strong cold front will cross the Yucatan Channel Wed,
extend from western Cuba to the Gulf of Honduras Wed night, then
stall and weaken over the NW Caribbean Thu into Thu night. Winds
and seas will gradually diminish over the NW Caribbean Fri and Fri
night. Mixed N swell and E wind waves will maintain seas 8 ft or
greater over the Tropical N Atlantic waters for the next several
days before diminishing on Fri.
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AMZ023-170245-
Caribbean N of 15N between 64W and 72W-
934 AM EST Mon Dec 16 2019

.TODAY...NE to E winds 20 to 25 kt in the afternoon.
Seas 6 to 9 ft in NE swell.
.TONIGHT...E winds 20 to 25 kt. Seas 6 to 9 ft in N to NE swell.
.TUE...E winds 20 to 25 kt. Seas 6 to 9 ft in N to NE swell.
Scattered showers and isolated tstms.
.TUE NIGHT...E winds 20 kt. Seas 6 to 9 ft in N to NE swell.
Scattered showers and isolated tstms.
.WED...E winds 15 to 20 kt. Seas 6 to 8 ft in NE swell.
.WED NIGHT...E winds 15 to 20 kt. Seas 6 to 8 ft.
.THU...E winds 15 to 20 kt. Seas 5 to 7 ft.
.THU NIGHT...E winds 15 to 20 kt. Seas 4 to 6 ft.
.FRI...E winds 15 to 20 kt. Seas 4 to 6 ft.
.FRI NIGHT...E winds 15 to 20 kt. Seas 3 to 5 ft.
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Figure 6. TAFB synopsis and marine zone forecasts for eastern Caribbean Sea issued Monday morning, December 16, 2019

The TAFB surface analysis products issued every six hours but displayed here every 24 hours for the 00z times of December 15 to December 18, 2019 (figures 7 through 10) show higher pressure to the north as indicated by the orientation of the isobars from left to right. The lowering of air pressure over Colombia later in the time periods helped tighten the pressure gradient across the Caribbean Sea increasing the easterly breezes. Many of the ship, buoy, and nearby land observations showed this increase in wind speed. On the December 17 evening (00z, Dec 18) surface map, the passenger ship Carnival Horizon reported 30 knot winds and 7 foot seas near 17.6°N, 68.9°W or about 60 nautical miles southeast of Boca Chica, DR (table 1).

No significant weather features are noted in the surface analysis products nor is it uncommon for strong easterly winds to blow across the Caribbean Sea during the winter months as nearby cold fronts to the north help introduce periodic high pressure systems, strengthening the pressure difference across the area and increasing winds/seas.

Additionally, winds during the period in question increased and decreased and increased again all while backing and veering. The overall trend was toward stronger sustained winds resulting in higher seas, however it wasn't a continuous slope but more of a more, then less, then even more for both winds and seas.

Figure 7. TAFB surface analysis for eastern Caribbean Sea issued Saturday evening, December 14, 2019.

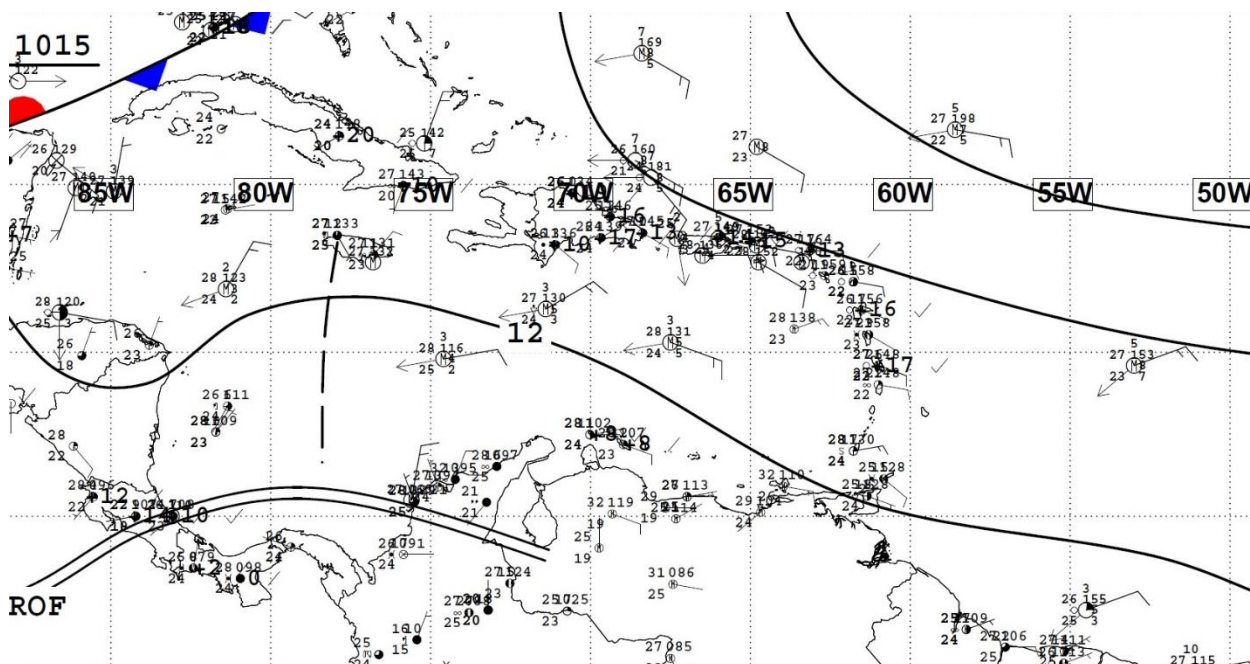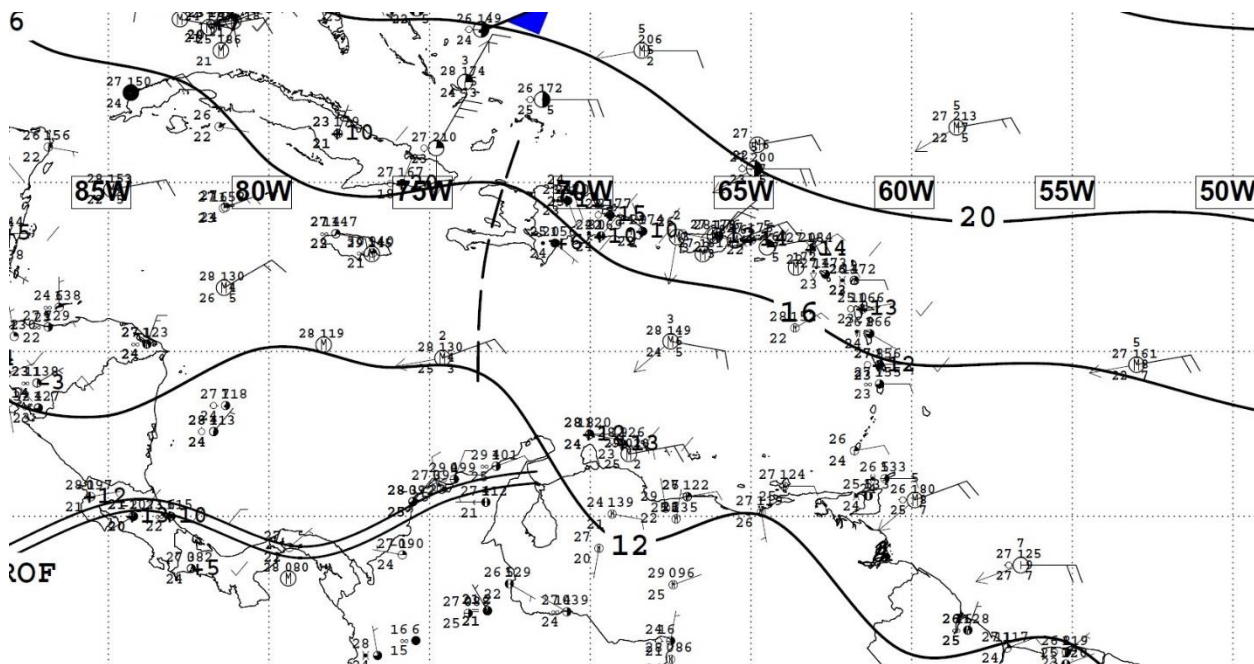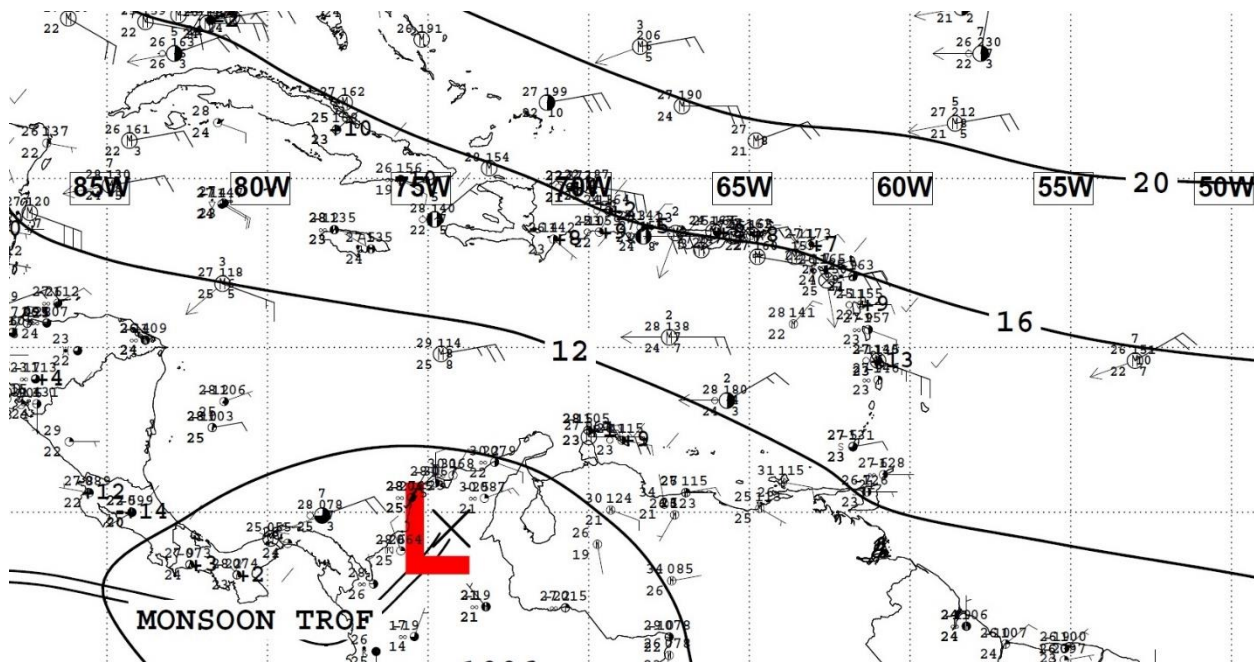*Figure 8. TAFB surface analysis for eastern Caribbean Sea issued Sunday evening, December 15, 2019.*

Figure 8. TAFB surface analysis for eastern Caribbean Sea issued Monday evening, December 16, 2019.
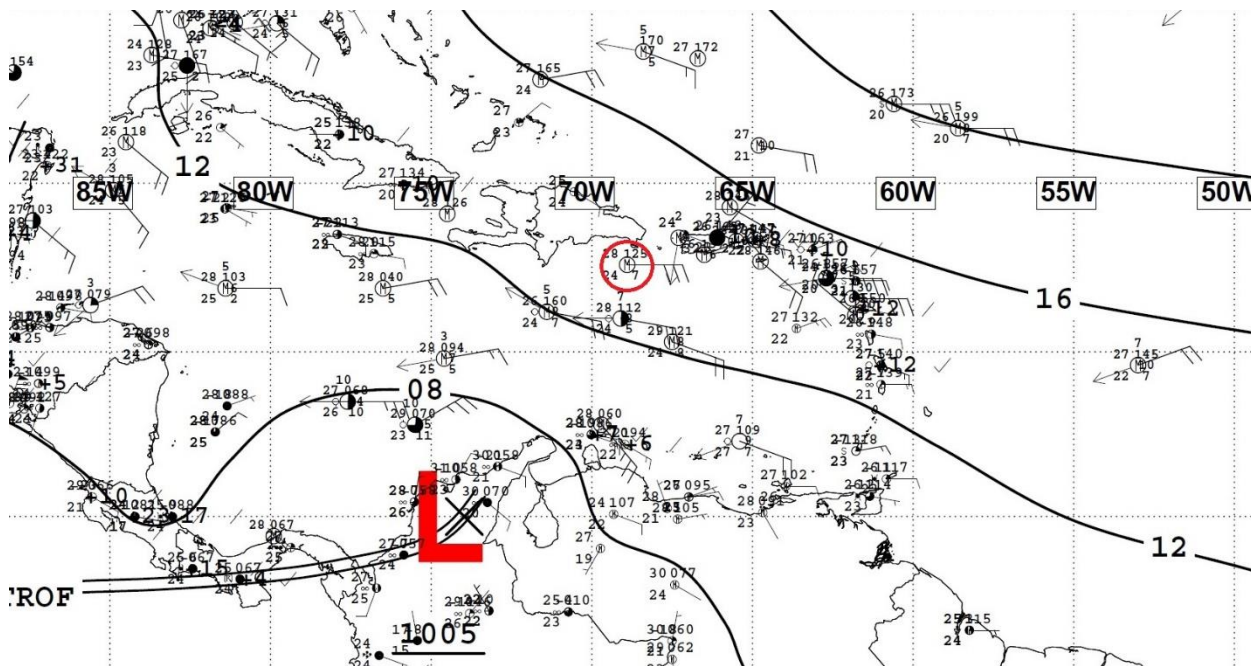
Figure 9. TAFB surface analysis for eastern Caribbean Sea issued Tuesday evening, December 17, 2019. Red circle indicates observation of Carnival Horizon reporting 30 knot winds and 7 foot seas.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

COMMON MARINE FORMAT
2019-12-18
Generated on 02/17/2022

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location:
Station: H3WI

TIME	LAT	LON	WIND		VIS	WEATHER		PRESSURE			TEMPERATURE				CLOUDS						WAVE			SWELL			SHIP		ICE		
			DIR	SPD		PR	PA	SLP	3HR	CC	DB	WB	DP	SS	TOT	LOW	HGT	HIGH	MID	LOW	DIR	PER	HGT	DIR	PER	HGT	DIR	SPD	ACC	THK	RATE
00:00	17.6	-68.9	90	29.9				29.90	0.01	5	82.4	77.0	74.7	82.4			A					10	4				4	4			
01:00	17.3	-68.9	90	35.0				29.90	0.01	5	82.4	77.0	74.7	82.4			A					10	5				4	4			
02:00	17.1	-69.0	90	33.0	98	0	0	29.90	0.00		82.4	75.2	71.8	82.4			A										4	4			
04:00	16.5	-69.0	100	35.0	98	0	0	29.88	0.02	8	82.4	75.2	71.8	82.4			A				38						4	4			
06:00	15.8	-69.0						29.85	0.04	8							A										4	4			
07:00	15.5	-69.0						29.84	0.04	8							A										4	4			
08:00	15.2	-69.0						29.83	0.04	6							A										4	4			
09:00	14.9	-69.1						29.83	0.03	5							A										4	4			
10:00	14.3	-69.1	90	35.0	98			29.84	0.01	3	82.4	78.8	77.4	82.4	5	5	6	A	A	5		10	6				4	4			
11:00	14.2	-69.1	100	34.0	98		1	29.84	0.01	3	83.7	77.0	74.1	82.4	4	4	5	A	9	2	14	5	4	13	5		4	5			
12:00	13.8	-69.1			98		0	29.85	0.02	1	83.7	77.4	74.7	82.4	2	2	5	A	9	1	5	5	4	13	5	5	4	4			
13:00	13.5	-69.1			98		0	29.88	0.05	3	83.5	77.7	75.2	82.4	2	2	6	A	A	5		5	4	13	5	4	4	4			
14:00	13.1	-69.2	100	35.0	98	2	1	29.88	0.04	3	78.8		74.1	80.6	4	4	6	0	0	4		15	4	0			4	4			
15:00	12.7	-69.2	100	35.0	98	2	0	29.87	0.02	0	78.8		72.3	80.6	3	3	4	0	0	1		10	4	0			4	4			

Table 1. Carnival Horizon marine weather reports for December 17-18, 2019.
8:00PM LST, December 17, 2019 record highlighted.

The NOAA buoy, number 42059, during the period from December 14, 2019 to December 18, 2019 reported marine weather observations every 10 minutes (supplement 1). The wind speed values are averaged over a 10-minute period and often have a low bias to what is observed in a marine environment. For the purpose of this report, the peak 5-second gust speed for each 10-minute period is used. The following are the highlights from that buoy data:

Dec 14 evening into Dec 15 overnight – steady ESE breeze 17 to 21 knots, seas 5 to 6 feet

Dec 15 early morning – ESE breeze builds to 20 to 27 knots, seas 6 to 7 feet

Dec 15 mid-morning into late afternoon – slight lull in winds, more easterly direction, 20 to 24 knots, seas 6 to 6.5 feet

Dec 15 evening – winds back to slightly north of east and steady 22 to 24 knots, except gusts to 34 knots likely due to passing showers, seas 6.5 to 7.5 feet

Dec 16 overnight through Dec 16 evening – winds remain slightly north of east, steady 20 to 22 knots, seas 6.5 to 7.5 feet

7

Dec 17 overnight through Dec 17 midday – winds veer slightly to east 20 to 24, seas 7 to 8 feet

Dec 17 afternoon into evening – winds veer and increase to ESE 22 to 26 knots, seas build to over 8 feet

It should be noted that the wave height or "seas" observed from ships, reported by NOAA buoys, forecasted in a marine weather forecast, and used in this report are technically called Significant Wave Heights. This is the highest one third of waves in a spectrum of wave heights created by wind speed, wind duration, and ocean fetch length. While most waves will be near or below this height, according to ocean wave theory[1], 1 in 10 waves will be 27% higher, and 1 in 100 waves will be 67% higher. Most waves in seas of 8 feet will be 8 feet high or less, from trough to crest, but some waves will be 10 feet high, and an infrequent wave will be 13 feet high. And in a 24-hour period, roughly three waves will be 16 feet, or twice as high as the Significant Wave Height.

Summary and opinion.
The marine weather conditions that existed between December 14 and December 17, 2019 were fairly typical of winter weather in the Caribbean. Generally easterly winds near 20 knots increased over time to averages in the mid-20s with some higher gusts above 30 knots. This strong wind resulted in building waves initially around 5 feet but eventually exceeding 8 feet.

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[1] National Weather Service "Note to Users of Wave Forecasts" www.weather.gov/media/mlb/marine/wave_theory.pdf

Eastern Caribbean Marine Weather Conditions December 14 to December 18, 2019
Supplemental Report – Sailing Conditions

Craig Setzer, Meteorologist
Setzer Weather LLC

Assignment.
Determine the conditions a 47 foot Catana catamaran sailing vessel named "Melody" (Melody) would have experienced while attempting to traverse the eastern Caribbean Sea from Aruba to St. Maarten, but ending at Boca Chica, DR during the previously discussed marine weather conditions. The conclusions and opinions of this supplemental report are based upon the weather information referenced in the primary report, as well as the testimony of Martin Andersson contained in the deposition by Zoom on Friday, June 4, 2021.

Discussion.
Unlike a motor-powered vessel, when under sail (with sails deployed), a sailboat's heading (direction of travel) is constrained by the direction of the wind. The angle and velocity of the wind create lift or pressure on the sails causing the sailboat to move through the water. The relative angle of the wind across the sails, known as apparent wind, can be optimized by adjusting the sails and/or the direction of the boat. However, a sailboat cannot sail directly into the wind. This point of sail, known as "head to wind" or "in irons", stalls the effectiveness of the sails and stops forward motion of a sailboat (figure 10).
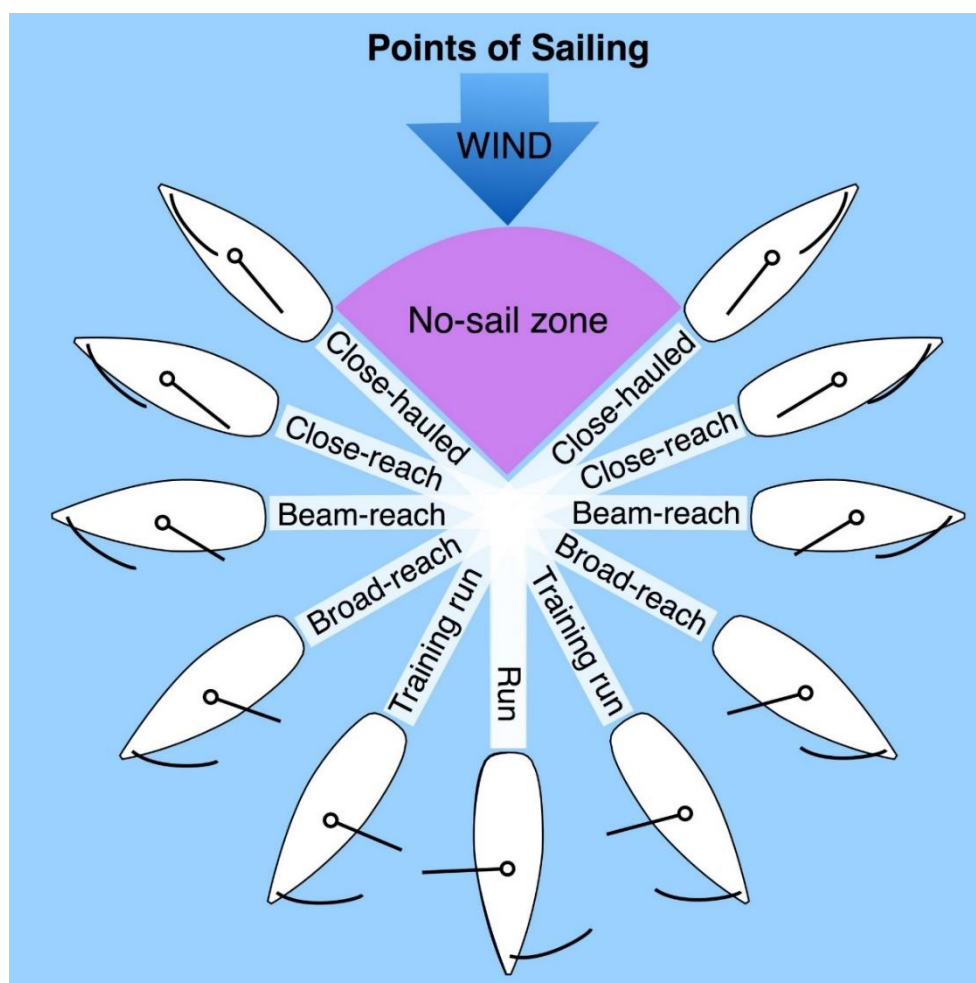
Figure 10. Points of sail relative to the wind direction.

Most sailboats cannot sail an angle less than 60 to 90 degrees into the wind. In other words, if the wind is from the east or 90 degrees, a sailboat cannot sail a heading more easterly than 135 degrees (SE) or more easterly than 45 degrees (NE). A sailboat in this example could sail any direction on the compass except between northeast and southeast. A motor equipped sailboat can overcome some of this "no-sail zone" by powering the boat at angles closer to the wind, but even then, there remains a direction a sailboat cannot go while sails are unfurled without the sails flogging (flapping) in the wind.

The Melody began its journey from Aruba with 15 to 20 knots of breeze blowing from approximately 110 degrees (ESE) on the evening of December 14, 2019. Wave heights were in the 5 to 6 foot range. According to testimony, the vessel was under motor power and flying a headsail[2], and after clearing a land obstruction (Aruba) to its north, the vessel changed heading to between 55 and 60 degrees (ENE)[3], which was likely the closest it could have sailed into the wind as discussed above. This heading continued until later in the day on December 15 when the vessel made course adjustments to the left or more northeastward[4]. This lines up very closely with an observed backing wind at NOAA buoy 42059 from 110 degrees (ESE) to around 90 degrees (E) during the afternoon and evening of December 15 (supplement 1, NOAA buoy data). By late evening on the 15th, winds and seas began to build making for an increasingly uncomfortable ride for the crew of Melody[5].

By the overnight hours into the morning of December 16, the winds backed further to around 85 degrees (slightly north of due east) and were steady in the 22 to 26 knot range with some higher gusts. Seas continued to slowly build to around 7 feet. This additional backing of the wind likely caused an additional northward course adjustment by the Melody to keep its sail flying. These marine conditions would last through that day and into the following night.

Early on December 17th, after dropping some in velocity from midnight to late morning, winds began to veer back to a more east to east southeast direction, and the wind speed increased again to between 22 and 26 knots by midday. Seas continued to build and were exceeding 8 feet by late afternoon on the 17th. These conditions continued into the evening of December 17, and as mentioned in the primary report (page 8), the passenger ship Carnival Horizon reported 30 knot winds and 7 foot seas near 17.6°N, 68.9°W or about 60 nautical miles southeast of Boca Chica, DR around 8:00PM, December 17. Despite the more easterly wind and better sailing angle towards the northeast on December 17, it's likely the Melody established a more "off-wind" course (northward component), and more comfortable sailing wave angle, due to the increasing seas.

Conclusions and opinion.
Based on the departure point of the Melody from Barcadero Port, Aruba, and its final resting place near Boca Chica, DR, some 73 hours later, the vessel at some point changed course from its initial ENE heading to a more northerly and possibly northwesterly direction. The vessel was under sail (headsail only) the entire voyage while at times being under motor propulsion as well[6]. It is my opinion that the skipper likely sailed as close to the wind as possible[7], while keeping the sail filled (also known as "close-hauled" or "beating") on starboard tack (wind crossing the boat from right to left as the boat moves forward through the wind) for the first portion of the passage. As the wind direction backed (became more northeasterly, a counterclockwise change) late on December 15th, the skipper adjusted his heading toward the northeast to match the changing wind direction, still sailing as close to the wind as the headsail would allow. Sailing as close to the wind as possible is also called "beating" by sailors because you often feel the pounding of the boat through the waves on this point of sail. This "beating" into the wind continued until sometime on the 16th, when increasing wind velocity and ocean wave height made this point of sail unmaintainable. From this point on, and likely with small heading adjustments, the skipper likely "fell off the wind", meaning he would no longer sail as directly into the wind (and waves) as much as possible, adjusting the point of sail to a "beam reach" or more comfortable sailing direction. This "reaching" point of sail, based on wind direction, was a more northward heading, and toward Puerto Rico and the Dominican Republic.

Based on the observed weather conditions, and the testimony of the skipper referenced above as to how he was sailing the Melody, it is my opinion the ground track of the vessel likely made an initially slow arcing path across the eastern Caribbean, from east northeast to eventually northeast, and then more sharply toward the north and northwest.

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[2] Deposition By Zoom Of Martin Andersson, Friday, June 4th, 2021, commencing at 10:02 a.m., pg. 106-107.

[3] Andersson Deposition, pg. 61

[4] Andersson Deposition, pg. 150

[5] Andersson Deposition, pg. 186

[6] Andersson Deposition, pg. 205

[7] Andersson Deposition, pg. 151

Eastern Caribbean Marine Weather Conditions December 14 to December 18, 2019
Supplemental Report – Sailed Course

Craig Setzer, Meteorologist
Setzer Weather LLC

Assignment.
Based on the weather and sailing conditions in the eastern Caribbean Sea from December 14 to December 18, 2019, as referenced in the two preceding reports, determine whether a 47 foot Catana catamaran sailing vessel named "Melody" (Melody) would have been able to complete a journey from Aruba to Boca Chica, DR within 73 hours and not violate the vessel's 150 nautical miles (NM) from land navigational limits to its insurance policy.

Discussion.
To help determine if the Melody's track remained within 150 NM from land, a nautical chart was created (figure 11) detailing the eastern Caribbean Sea with range rings from all applicable land extensions toward the center of the sea. These 150 NM ring segments essentially map out a boundary of inside (and outside) the policy's navigational limits. To improve the boundary visibility, the "exclusion zone" (outside the policy navigational limits) has been shaded red.
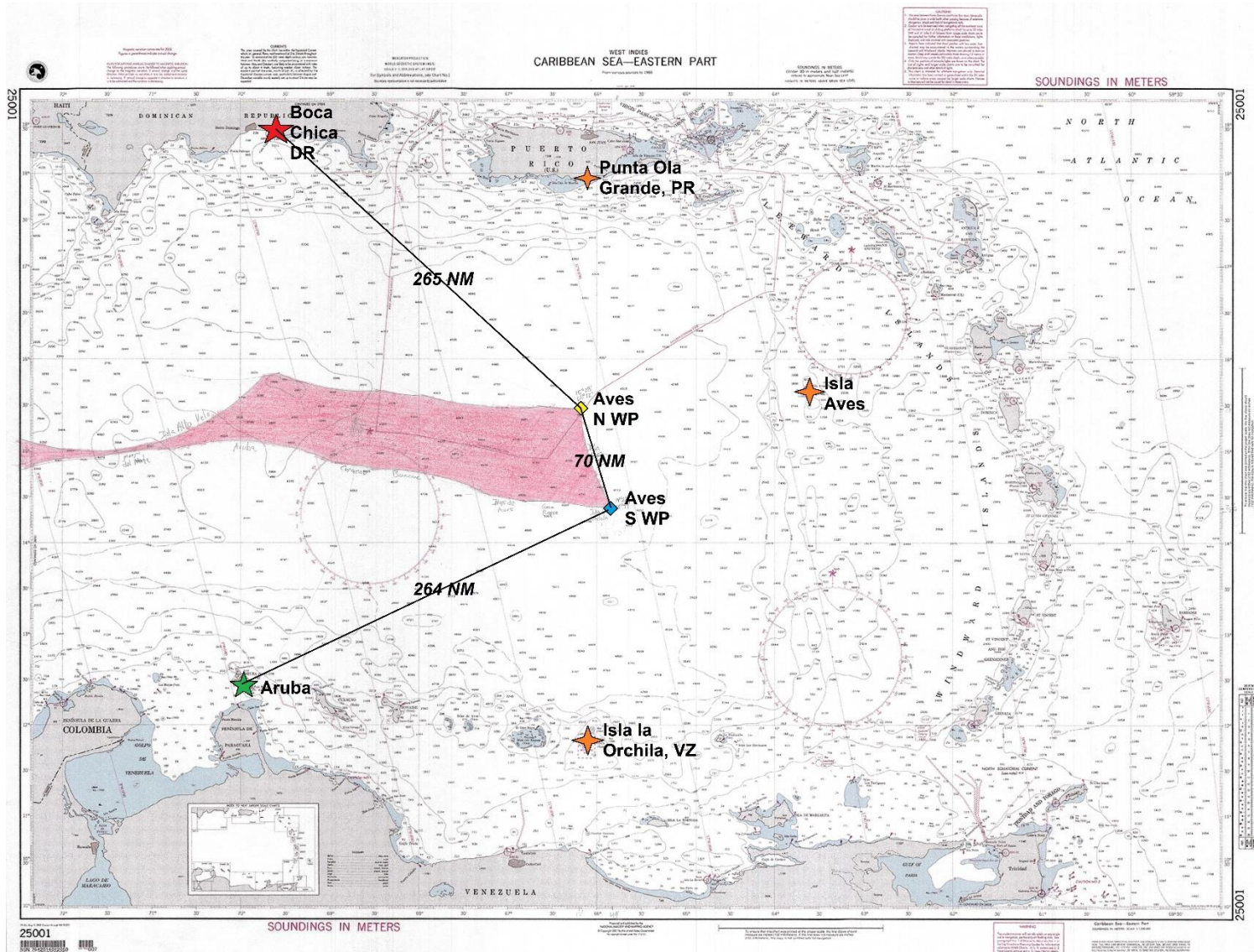
Figure 11. National Geospatial-Intelligence Agency chart 25001 of eastern Caribbean Sea. Policy navigational limits are annotated in red.

Of interest in this report is the eastern edge of the boundary, formed by 150 NM range rings from Isla la Orchila, VZ (11.7970°N, 66.1534°W), Isla de Aves, VZ (15.6684°N, 63.6180°W), and Punta Ola Grande, PR (17.9284°N, 66.1596°W). The intersection of these three ring segments forms two points, hereafter designated Aves South Way Point (Aves S WP) located at 14.3667°N, 65.8167°W, and Aves North Way Point (Aves N WP) located at 15.4667°N, 66.2000°W. These way points would have to be rounded to port, that is, leaving the way points to the west or left side of a vessel, in order to avoid the exclusion zone. The other east-west boundaries of the zone would have to be avoided as well.

Upon leaving Barcadero Port, Aruba, a vessel would travel approximately 10 NM southeast, following the southern coast of Aruba before it could turn northeastward into the open Caribbean Sea. From there, the distance to the first way point, Aves S WP, is approximately 264 NM. Once the Aves S WP is rounded to port, it is another 70 NM on a slightly west of north heading to Aves N WP. Again, this position needs to be rounded leaving the way point to port, or on the west (left) side of a vessel. From there a northwest heading for 265 NM would take a vessel to Boca Chica, DR.

While the Melody likely did not sail to these exact points nor this exact route, it only needed to honor these way points to not violate the navigational limits of the policy. The total distance from a departure point of Barcadero Port, Aruba to Boca Chica, DR while honoring the Isla Aves way points is 610 NM. In order to travel 610 NM in 73 hours, the vessel would have to travel an average speed of 8.3 knots.

Due to the performance characteristics of sailing vessels headed "upwind" or into the wind, versus with the wind, sometimes called "off the wind", the Melody likely made headway at different boat speeds based on apparent wind direction and wave conditions over different parts of the voyage. Initially, during the upwind phase of the journey, the boat speed would have been slower than 8.3 knots. This slower forward progress would have been compensated for with a faster, off wind boat speed during the latter segment of the journey. These performance characteristics can be seen in the Catana 47's sail plan polar chart (figure 12). And while these polars are for use with full sail area deployed, even with partial sail area, the point of sail with respect the apparent wind angle shows the fastest boat speeds are when sailing from close reach to broad reach (see previous figure 10). This is indicated by the red lines extending out farthest in the 68 to 112 degree angles indicating the highest sail performance is when apparent wind is on the beam the vessel. There is even substantial downwind performance as seen in the brown curved lines of the polar chart.
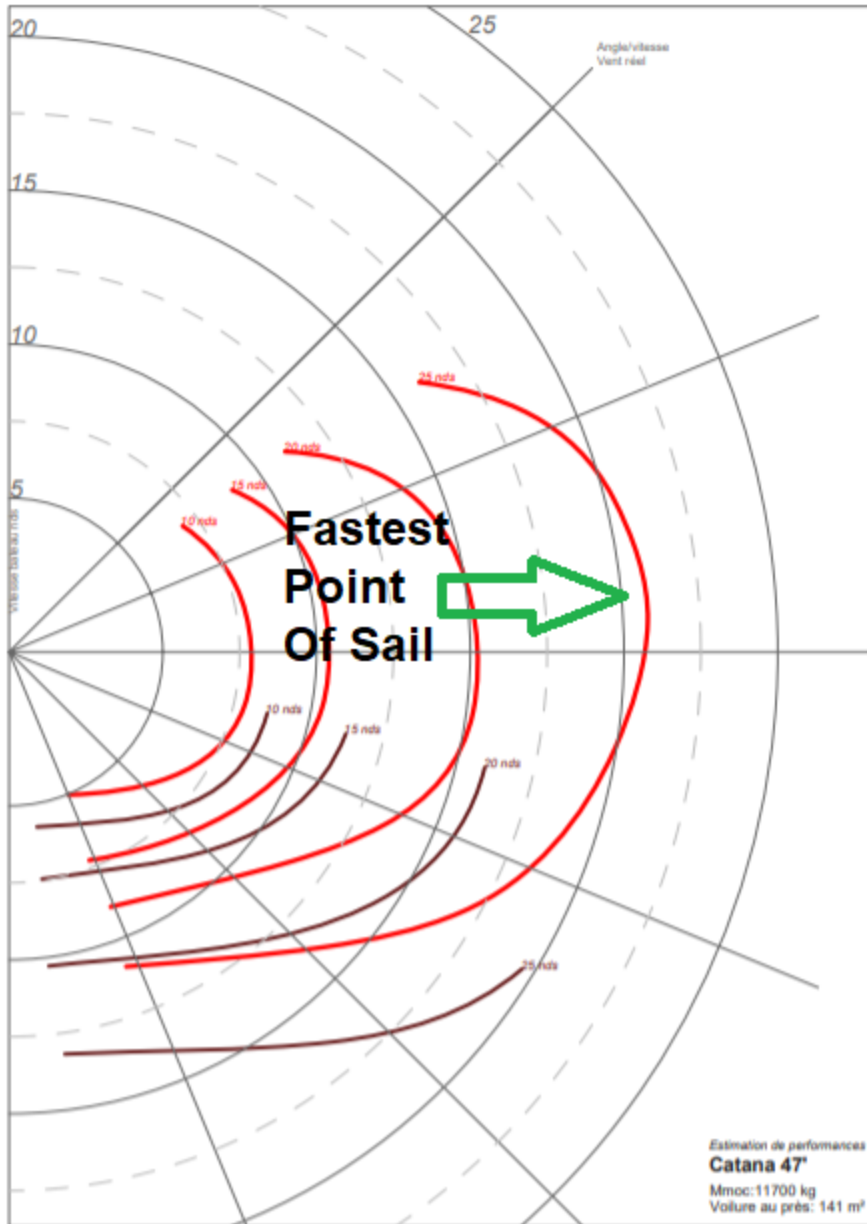
Figure 12. Catana 47' sail plan polar chart. Red arcing lines indicate wind speed, background rings indicate boat speed, radial lines indicate apparent wind angle in 22.5 degree segments.

Under full sail with 25 knots of breeze and ideal conditions, a Catana 47 will travel through the water at 22 knots. Even deep downwind, often a slower point of sail for many sailboats, the boat will move at 16 knots with 25 knots of breeze. While these values should be considered the upper bounds of a Catana 47, it shows the high-performance characteristics of this type of catamaran. Off the wind, with a partially furled headsail, the speed of the boat should have been well over 10 knots.

Conclusion and opinion.
Based on the weather and marine conditions referenced in the previous two reports, the above reasoning and discussion, and the requirement that the Melody complete the 610 NM journey, while honoring certain navigational requirements, in a three-day timeframe, which is an average speed of 8.3 knots, it is my opinion this voyage would have been well within the Melody's capabilities. It is also my opinion that it is feasible the Melody made its mid-December 2019 journey across the eastern Caribbean Sea while NOT violating the insurance policy's 150 NM from land navigational provision.

Supplement 1. NOAA Buoy Data. Continuous marine weather observations from NOAA buoy 42059.
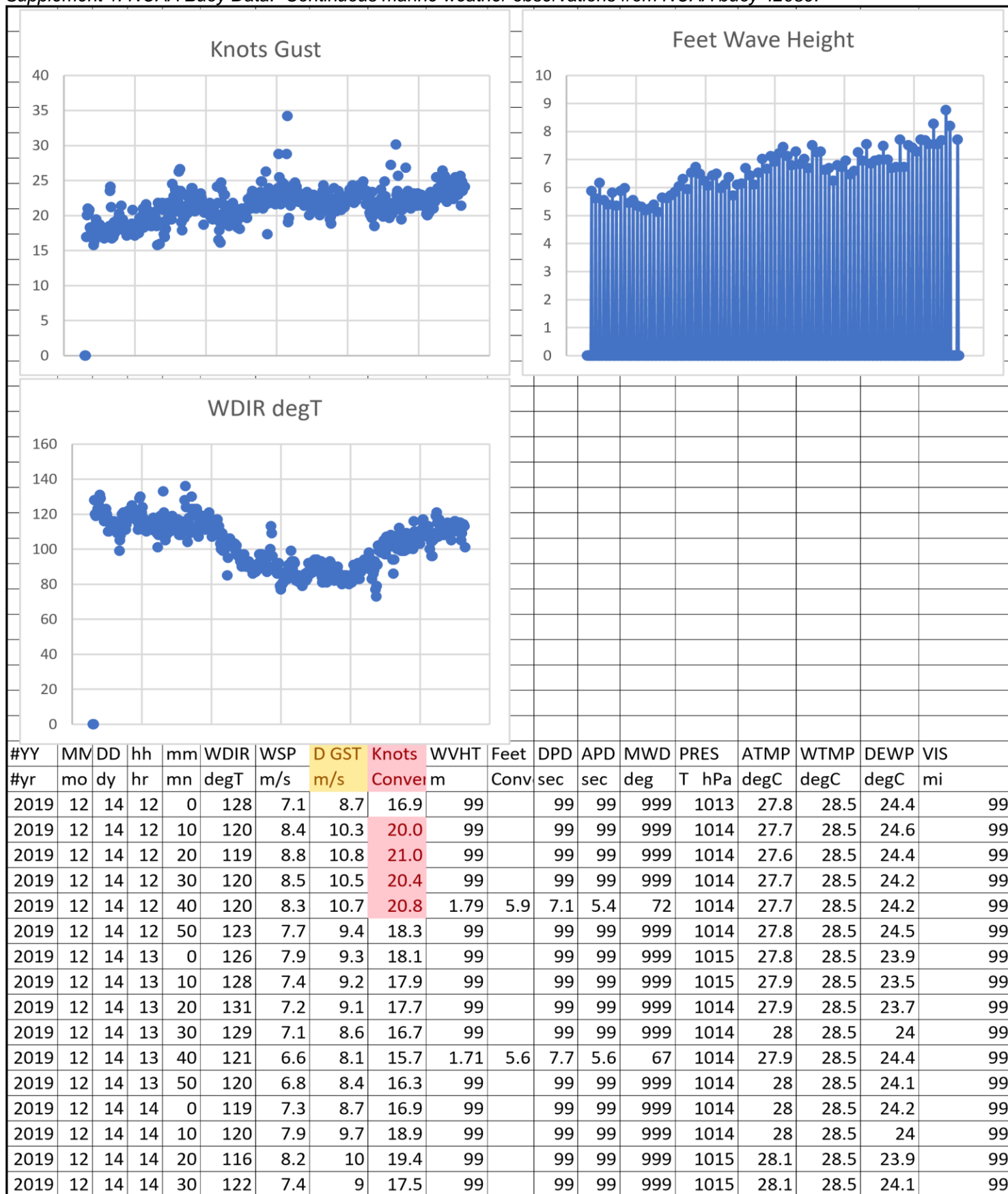
Knots Gust

Feet Wave Height

WDIR degT

#YY	MM	DD	hh	mm	WDIR	WSP	D GST	Knots	WVHT	Feet	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS
#yr	mo	dy	hr	mn	degT	m/s	m/s	Conver	m	Conv	sec	sec	deg	T hPa	degC	degC	degC	mi
2019	12	14	12	0	128	7.1	8.7	16.9	99		99	99	999	1013	27.8	28.5	24.4	99
2019	12	14	12	10	120	8.4	10.3	20.0	99		99	99	999	1014	27.7	28.5	24.6	99
2019	12	14	12	20	119	8.8	10.8	21.0	99		99	99	999	1014	27.6	28.5	24.4	99
2019	12	14	12	30	120	8.5	10.5	20.4	99		99	99	999	1014	27.7	28.5	24.2	99
2019	12	14	12	40	120	8.3	10.7	20.8	1.79	5.9	7.1	5.4	72	1014	27.7	28.5	24.2	99
2019	12	14	12	50	123	7.7	9.4	18.3	99		99	99	999	1014	27.8	28.5	24.5	99
2019	12	14	13	0	126	7.9	9.3	18.1	99		99	99	999	1015	27.8	28.5	23.9	99
2019	12	14	13	10	128	7.4	9.2	17.9	99		99	99	999	1015	27.9	28.5	23.5	99
2019	12	14	13	20	131	7.2	9.1	17.7	99		99	99	999	1014	27.9	28.5	23.7	99
2019	12	14	13	30	129	7.1	8.6	16.7	99		99	99	999	1014	28	28.5	24	99
2019	12	14	13	40	121	6.6	8.1	15.7	1.71	5.6	7.7	5.6	67	1014	27.9	28.5	24.4	99
2019	12	14	13	50	120	6.8	8.4	16.3	99		99	99	999	1014	28	28.5	24.1	99
2019	12	14	14	0	119	7.3	8.7	16.9	99		99	99	999	1014	28	28.5	24.2	99
2019	12	14	14	10	120	7.9	9.7	18.9	99		99	99	999	1014	28	28.5	24	99
2019	12	14	14	20	116	8.2	10	19.4	99		99	99	999	1015	28.1	28.5	23.9	99
2019	12	14	14	30	122	7.4	9	17.5	99		99	99	999	1015	28.1	28.5	24.1	99

#YY	MM	DD	hh	mm	WDIR	WSP	D GST m/s	Knots Conver	WVHT	Feet	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS
#yr	mo	dy	hr	mn	degT	m/s			m	Conve	sec	sec	deg	T hPa	degC	degC	degC	mi
2019	12	14	14	40	121	7.9	9.5	18.5	1.88	6.2	7.7	5.7	76	1015	28	28.5	23.9	99
2019	12	14	14	50	123	7.6	9.5	18.5	99		99	99	999	1014	28.2	28.5	23.8	99
2019	12	14	15	0	120	7.9	9.5	18.5	99		99	99	999	1014	28.2	28.5	24.1	99
2019	12	14	15	10	118	7.8	9.6	18.7	99		99	99	999	1014	28.1	28.5	24.1	99
2019	12	14	15	20	110	7.3	8.8	17.1	99		99	99	999	1014	28	28.5	24.7	99
2019	12	14	15	30	110	7.7	9.3	18.1	99		99	99	999	1014	27.8	28.5	24.4	99
2019	12	14	15	40	115	7.6	9.1	17.7	1.69	5.5	7.1	5.5	82	1014	27.9	28.6	24.3	99
2019	12	14	15	50	114	7.5	9.1	17.7	99		99	99	999	1014	27.9	28.6	24.5	99
2019	12	14	16	0	116	7.5	9	17.5	99		99	99	999	1014	27.9	28.6	24.5	99
2019	12	14	16	10	116	7	8.6	16.7	99		99	99	999	1014	28	28.6	24.8	99
2019	12	14	16	20	115	7.3	8.7	16.9	99		99	99	999	1014	27.9	28.6	24.7	99
2019	12	14	16	30	112	7.4	9.1	17.7	99		99	99	999	1013	27.9	28.6	24.7	99
2019	12	14	16	40	115	7.3	8.8	17.1	1.64	5.4	7.1	5.3	69	1013	27.9	28.6	24.6	99
2019	12	14	16	50	116	7.3	8.9	17.3	99		99	99	999	1013	28	28.6	24.6	99
2019	12	14	17	0	112	7	9.1	17.7	99		99	99	999	1013	28.1	28.6	24.8	99
2019	12	14	17	10	114	7.3	9.1	17.7	99		99	99	999	1013	28.2	28.6	24.7	99
2019	12	14	17	20	111	7.7	9.5	18.5	99		99	99	999	1013	28.2	28.6	24.6	99
2019	12	14	17	30	109	8.2	12.1	23.5	99		99	99	999	1013	28.2	28.6	24.4	99
2019	12	14	17	40	114	9.9	12.4	24.1	1.77	5.8	7.7	5.5	67	1013	27.1	28.6	24	99
2019	12	14	17	50	115	8.1	10.9	21.2	99		99	99	999	1013	26.7	28.6	24.3	99
2019	12	14	18	0	99	6.3	8.6	16.7	99		99	99	999	1013	26.4	28.6	24.1	99
2019	12	14	18	10	105	6.8	9.1	17.7	99		99	99	999	1012	27.3	28.6	24	99
2019	12	14	18	20	108	7.1	8.7	16.9	99		99	99	999	1012	27.9	28.6	24.4	99
2019	12	14	18	30	112	7.4	9.8	19.0	99		99	99	999	1012	28.1	28.6	24.7	99
2019	12	14	18	40	120	7.4	9	17.5	1.63	5.3	7.1	5.3	88	1012	28.3	28.6	24.7	99
2019	12	14	18	50	115	7.8	9.8	19.0	99		99	99	999	1012	28.3	28.6	24.6	99
2019	12	14	19	0	121	7.7	9.6	18.7	99		99	99	999	1012	28.4	28.6	24.4	99
2019	12	14	19	10	114	7.7	9.2	17.9	99		99	99	999	1012	28.4	28.6	24.5	99
2019	12	14	19	20	117	8	10	19.4	99		99	99	999	1012	28.4	28.6	24.4	99
2019	12	14	19	30	111	8.1	10	19.4	99		99	99	999	1012	28.4	28.6	24.4	99
2019	12	14	19	40	114	8.6	10.4	20.2	1.79	5.9	7.1	5.6	89	1012	28.1	28.6	24.5	99
2019	12	14	19	50	118	8	9.8	19.0	99		99	99	999	1012	28.2	28.6	24.5	99
2019	12	14	20	0	120	7.8	9.5	18.5	99		99	99	999	1012	28.3	28.6	24.6	99
2019	12	14	20	10	122	8.2	11	21.4	99		99	99	999	1012	28.2	28.6	24.4	99
2019	12	14	20	20	122	7.5	9.6	18.7	99		99	99	999	1012	28.2	28.6	24.3	99
2019	12	14	20	30	119	8.3	10	19.4	99		99	99	999	1012	28.4	28.6	24.2	99

#YY	MM	DD	hh	mm	WDIR	WSP	D GST m/s	Knots Conver	WVHT	Feet Conve	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS
2019	12	14	20	40	122	8.2	9.6	18.7	1.82	6.0	7.7	5.6	91	1012	28.4	28.6	24	99
2019	12	14	20	50	122	7.7	9.2	17.9	99		99	99	999	1012	28.5	28.6	24.1	99
2019	12	14	21	0	125	7.5	9.4	18.3	99		99	99	999	1012	28.5	28.6	24.1	99
2019	12	14	21	10	121	7.7	9.6	18.7	99		99	99	999	1012	28.4	28.6	24.1	99
2019	12	14	21	20	123	7.7	9.4	18.3	99		99	99	999	1012	28.4	28.6	24.4	99
2019	12	14	21	30	119	7.4	8.8	17.1	99		99	99	999	1012	28.3	28.6	24.5	99
2019	12	14	21	40	121	7.3	8.9	17.3	1.66	5.4	6.7	5.4	81	1012	28.3	28.6	24.5	99
2019	12	14	21	50	117	7.2	8.9	17.3	99		99	99	999	1012	28.3	28.6	24.6	99
2019	12	14	22	0	119	7.5	9.4	18.3	99		99	99	999	1012	28.3	28.6	24.3	99

#YY	MM	DD	hh	mm	WDIR	WSP	D GST m/s	Knots Conver	WVHT	Feet Conve	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS
#yr	mo	dy	hr	mn	degT	m/s			m		sec	sec	deg	T hPa	degC	degC	degC	mi
2019	12	14	22	10	120	7.4	8.9	17.3	99		99	99	999	1012	28.4	28.6	24.3	99
2019	12	14	22	20	118	7.3	9.4	18.3	99		99	99	999	1012	28.4	28.6	24.3	99
2019	12	14	22	30	111	7.9	9.5	18.5	99		99	99	999	1012	28.2	28.6	24.7	99
2019	12	14	22	40	114	8	9.7	18.9	1.69	5.5	6.3	5.5	85	1012	28.1	28.6	24.8	99
2019	12	14	22	50	129	8.7	10.7	20.8	99		99	99	999	1013	27.8	28.6	24.6	99
2019	12	14	23	0	130	6.3	9.3	18.1	99		99	99	999	1013	27.4	28.6	24.5	99
2019	12	14	23	10	117	8	9.6	18.7	99		99	99	999	1013	28	28.6	24.2	99
2019	12	14	23	20	121	7.2	8.8	17.1	99		99	99	999	1013	28.3	28.6	24.6	99
2019	12	14	23	30	124	7.1	9.1	17.7	99		99	99	999	1013	28.2	28.6	24.7	99
2019	12	14	23	40	118	7	9	17.5	1.63	5.3	6.7	5.3	88	1013	28	28.6	24.6	99
2019	12	14	23	50	111	7.9	9.7	18.9	99		99	99	999	1013	28.2	28.6	24.4	99
2019	12	15	0	0	111	8	9.3	18.1	99		99	99	999	1013	28.2	28.5	24.4	99
2019	12	15	0	10	115	7.9	9.2	17.9	99		99	99	999	1013	28.2	28.5	24.2	99
2019	12	15	0	20	115	7.7	9	17.5	99		99	99	999	1014	28.3	28.5	24.5	99
2019	12	15	0	30	110	8.4	10.1	19.6	99		99	99	999	1014	28.2	28.5	24.4	99
2019	12	15	0	40	113	7.9	9.8	19.0	1.62	5.3	6.7	5.3	84	1014	28.3	28.6	24.5	99
2019	12	15	0	50	111	8.2	9.8	19.0	99		99	99	999	1014	28.2	28.5	24.5	99
2019	12	15	1	0	113	8.2	10.2	19.8	99		99	99	999	1014	28.2	28.6	24.5	99
2019	12	15	1	10	113	8.6	10.3	20.0	99		99	99	999	1014	28.2	28.5	24.2	99
2019	12	15	1	20	114	8.5	10.8	21.0	99		99	99	999	1014	28	28.5	24.3	99
2019	12	15	1	30	111	7.8	9.4	18.3	99		99	99	999	1014	28.1	28.5	24.2	99
2019	12	15	1	40	111	7.9	10.3	20.0	1.58	5.2	7.1	5.2	71	1014	28.1	28.5	24.5	99
2019	12	15	1	50	116	8.4	10.1	19.6	99		99	99	999	1014	28.3	28.5	24.4	99
2019	12	15	2	0	114	8.4	11.1	21.6	99		99	99	999	1014	28.3	28.5	24.6	99
2019	12	15	2	10	118	8.1	9.9	19.2	99		99	99	999	1014	28.4	28.5	24.3	99
2019	12	15	2	20	112	8.5	10.7	20.8	99		99	99	999	1014	28.3	28.5	24.3	99
2019	12	15	2	30	111	8.4	10.1	19.6	99		99	99	999	1014	28.4	28.5	24.4	99

2019	12	15	2	40	115	8	9.7	18.9	1.6	5.2	6.7	5.3	86	1014	28.3	28.5	24.5	99
2019	12	15	2	50	115	8.3	10.3	20.0	99		99	99	999	1014	28.3	28.5	24.4	99
2019	12	15	3	0	109	8.3	10.1	19.6	99		99	99	999	1014	28.3	28.5	24.2	99
2019	12	15	3	10	101	7.7	9.5	18.5	99		99	99	999	1014	28.1	28.5	24.3	99
2019	12	15	3	20	108	8	9.5	18.5	99		99	99	999	1014	28.1	28.5	24.7	99
2019	12	15	3	30	113	8.2	10	19.4	99		99	99	999	1014	28.1	28.5	24.7	99
2019	12	15	3	40	115	8.3	10.4	20.2	1.64	5.4	7.7	5.3	82	1014	28.2	28.5	24.6	99
2019	12	15	3	50	119	8.3	10.4	20.2	99		99	99	999	1014	28.2	28.5	24.4	99
2019	12	15	4	0	117	8	9.6	18.7	99		99	99	999	1014	28.2	28.5	24.4	99
2019	12	15	4	10	115	8.5	10.2	19.8	99		99	99	999	1014	28.2	28.5	24.3	99
2019	12	15	4	20	117	8.3	10.6	20.6	99		99	99	999	1014	28.3	28.5	24.3	99
2019	12	15	4	30	133	7.4	9.5	18.5	99		99	99	999	1014	27.9	28.5	23.5	99
2019	12	15	4	40	121	6.7	8.1	15.7	1.56	5.1	6.7	5.4	74	1014	28.2	28.5	24.6	99
2019	12	15	4	50	113	7.7	11.2	21.8	99		99	99	999	1014	28.1	28.5	24.5	99
2019	12	15	5	0	105	7.6	9.6	18.7	99		99	99	999	1014	27.3	28.5	24	99
2019	12	15	5	10	112	6.6	8.2	15.9	99		99	99	999	1014	27.9	28.5	24.5	99
2019	12	15	5	20	108	7.2	9.8	19.0	99		99	99	999	1014	27.9	28.5	24.7	99
2019	12	15	5	30	110	7.8	9.7	18.9	99		99	99	999	1014	28.1	28.5	24.4	99

#YY	MM	DD	hh	mm	WDIR	WSP	D GST m/s	Knots Conver	WVHT m	Feet Conve	DPD sec	APD sec	MWD deg	PRES T hPa	ATMP degC	WTMP degC	DEWP degC	VIS mi
#yr	mo	dy	hr	mn	degT	m/s			m		sec	sec	deg		degC	degC	degC	mi
2019	12	15	5	40	110	7.5	9.8	19.0	1.72	5.6	7.1	5.5	75	1014	28.2	28.5	24.7	99
2019	12	15	5	50	117	9.4	11.2	21.8	99		99	99	999	1014	27.8	28.6	24.5	99
2019	12	15	6	0	113	8.2	10.7	20.8	99		99	99	999	1014	27.7	28.6	24.2	99
2019	12	15	6	10	110	7.3	8.9	17.3	99		99	99	999	1014	27.8	28.6	24.4	99
2019	12	15	6	20	111	7.3	8.7	16.9	99		99	99	999	1014	27.8	28.6	24.7	99
2019	12	15	6	30	117	7.7	9.3	18.1	99		99	99	999	1013	27.7	28.6	24.5	99
2019	12	15	6	40	119	7.7	9.3	18.1	1.71	5.6	10	5.5	54	1013	27.9	28.6	24.5	99
2019	12	15	6	50	117	7.4	9.9	19.2	99		99	99	999	1013	28.1	28.6	25	99
2019	12	15	7	0	116	8.3	10	19.4	99		99	99	999	1013	28.1	28.6	24.6	99
2019	12	15	7	10	117	9.1	11.2	21.8	99		99	99	999	1013	28.1	28.6	24.2	99
2019	12	15	7	20	115	8.6	10.4	20.2	99		99	99	999	1013	28.3	28.6	24.3	99
2019	12	15	7	30	114	8.5	10.1	19.6	99		99	99	999	1013	28.2	28.6	24.4	99
2019	12	15	7	40	111	8.5	10.7	20.8	1.74	5.7	7.1	5.4	81	1013	28.2	28.6	24.3	99
2019	12	15	7	50	114	8.7	10.6	20.6	99		99	99	999	1013	28.2	28.6	24.3	99
2019	12	15	8	0	117	8.3	10	19.4	99		99	99	999	1013	28.2	28.6	24.4	99
2019	12	15	8	10	111	9.4	12.6	24.5	99		99	99	999	1013	28	28.6	24.4	99
2019	12	15	8	20	108	8.8	11.4	22.2	99		99	99	999	1013	27.3	28.6	23.9	99
2019	12	15	8	30	113	9.3	11.7	22.7	99		99	99	999	1013	27.6	28.6	24	99

| #YY | MM | DD | hh | mm | WDIR | WSP | D GST | Knots | WVHT | Feet | DPD | APD | MWD | PRES | ATMP | WTMP | DEWP | VIS |
#yr	mo	dy	hr	mn	degT	m/s	m/s	Conver	m	Conve	sec	sec	deg	T hPa	degC	degC	degC	mi
2019	12	15	8	40	108	9.5	11.7	22.7	1.78	5.8	7.1	5.4	82	1013	27.9	28.6	24.3	99
2019	12	15	8	50	116	9.8	12.2	23.7	99		99	99	999	1013	27.9	28.6	24.3	99
2019	12	15	9	0	114	9.4	11.3	22.0	99		99	99	999	1013	27.9	28.6	24.3	99
2019	12	15	9	10	114	8.9	10.6	20.6	99		99	99	999	1014	27.9	28.6	24.2	99
2019	12	15	9	20	113	9.1	10.7	20.8	99		99	99	999	1014	28	28.6	24.4	99
2019	12	15	9	30	112	9.3	11.3	22.0	99		99	99	999	1014	28	28.6	24.5	99
2019	12	15	9	40	128	9.9	13.5	26.2	1.84	6.0	6.3	5.4	83	1014	27.7	28.6	24.1	99
2019	12	15	9	50	136	9.4	11.8	22.9	99		99	99	999	1014	27.4	28.6	23.6	99
2019	12	15	10	0	124	10.6	13.7	26.6	99		99	99	999	1014	27.1	28.6	23.9	99
2019	12	15	10	10	113	9.3	12.1	23.5	99		99	99	999	1014	26.5	28.6	23.7	99
2019	12	15	10	20	104	7.3	9.8	19.0	99		99	99	999	1014	26.7	28.6	24.4	99
2019	12	15	10	30	116	6.6	9.2	17.9	99		99	99	999	1014	27.2	28.6	24.4	99
2019	12	15	10	40	118	8.4	10.3	20.0	1.92	6.3	7.1	5.6	76	1014	27.9	28.6	24.7	99
2019	12	15	10	50	109	8.3	10.1	19.6	99		99	99	999	1014	28	28.6	24.7	99
2019	12	15	11	0	113	8.4	10.1	19.6	99		99	99	999	1014	28	28.6	24.6	99
2019	12	15	11	10	112	8.5	11.8	22.9	99		99	99	999	1014	28.1	28.6	24.5	99
2019	12	15	11	20	130	8.1	10.5	20.4	99		99	99	999	1015	27.9	28.6	24.5	99
2019	12	15	11	30	123	8.6	11	21.4	99		99	99	999	1015	27.9	28.6	24.9	99
2019	12	15	11	40	121	8.6	10.4	20.2	1.81	5.9	6.7	5.4	80	1015	27.9	28.5	25	99
2019	12	15	11	50	122	8.8	11	21.4	99		99	99	999	1015	28	28.5	24.6	99
2019	12	15	12	0	120	9.5	11.6	22.5	99		99	99	999	1015	28.3	28.5	24.5	99
2019	12	15	12	10	121	9.2	11.1	21.6	99		99	99	999	1015	28.4	28.5	24.5	99
2019	12	15	12	20	123	9.7	11.6	22.5	99		99	99	999	1015	28.4	28.5	24.2	99
2019	12	15	12	30	123	9.8	11.8	22.9	99		99	99	999	1016	28.5	28.5	24	99
2019	12	15	12	40	121	10.2	12.3	23.9	1.99	6.5	6.7	5.4	81	1016	28.5	28.5	24.1	99
2019	12	15	12	50	111	10.3	12.3	23.9	99		99	99	999	1016	28.3	28.5	23.6	99
2019	12	15	13	0	107	9	11.2	21.8	99		99	99	999	1016	28.4	28.5	23.6	99
2019	12	15	13	10	116	9.3	11.6	22.5	99		99	99	999	1016	28.4	28.5	23.9	99
2019	12	15	13	20	119	9.2	11.2	21.8	99		99	99	999	1016	28.5	28.6	24	99
2019	12	15	13	30	116	8.8	10.6	20.6	99		99	99	999	1016	28.5	28.6	24.1	99
2019	12	15	13	40	118	8.5	10.7	20.8	2.05	6.7	7.1	5.3	79	1016	28.6	28.6	24.2	99
2019	12	15	13	50	117	8.7	10.7	20.8	99		99	99	999	1016	28.6	28.6	24.5	99
2019	12	15	14	0	115	9	11.5	22.4	99		99	99	999	1016	28.5	28.5	24.3	99
2019	12	15	14	10	119	9.5	11.6	22.5	99		99	99	999	1016	28.6	28.5	23.8	99
2019	12	15	14	20	112	8.9	11.4	22.2	99		99	99	999	1016	28.5	28.6	24.3	99
2019	12	15	14	30	111	9	11.7	22.7	99		99	99	999	1016	28.5	28.6	24.3	99

#YY	MM	DD	hh	mm	WDIR	WSP	D GST	Knots Conver	WVHT	Feet	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS
2019	12	15	14	40	113	9.1	11.2	23.1	1.98	6.5	6.7	5.4	84	1016	28.5	28.6	24.2	99
2019	12	15	14	50	116	9.7	11.9	22.5	99		99	99	999	1016	28.6	28.6	24.1	99
2019	12	15	15	0	112	9.4	11.6	21.4	99		99	99	999	1016	28.6	28.6	24	99
2019	12	15	15	10	117	9.3	11	21.6	99		99	99	999	1016	28.6	28.6	24.2	99
2019	12	15	15	20	115	9.1	11.1		99		99	99	999	1016	28.7	28.6	24.3	99
2019	12	15	15	30	121	8	9.6	18.7	99		99	99	999	1016	28.5	28.6	24.8	99
2019	12	15	15	40	118	8.2	10.5	20.4	1.9	6.2	7.1	5.3	82	1016	28.5	28.6	24.6	99
2019	12	15	15	50	114	9	10.7	20.8	99		99	99	999	1016	28.6	28.6	24.1	99
2019	12	15	16	0	111	8.6	10.7	20.8	99		99	99	999	1016	28.7	28.6	24.2	99
2019	12	15	16	10	107	8.4	10.5	20.4	99		99	99	999	1016	28.6	28.6	24.3	99
2019	12	15	16	20	110	8.6	10.5	20.4	99		99	99	999	1016	28.6	28.6	24.2	99
2019	12	15	16	30	112	8.4	10.5	20.4	99		99	99	999	1015	28.6	28.6	24.2	99
2019	12	15	16	40	112	8.6	10.5	21.0	1.85	6.1	6.7	5.3	87	1015	28.6	28.6	24.1	99
2019	12	15	16	50	110	8.9	10.8	21.8	99		99	99	999	1015	28.6	28.6	23.8	99
2019	12	15	17	0	112	8.9	11.2		99		99	99	999	1015	28.7	28.6	23.7	99
2019	12	15	17	10	112	8.3	10.2	19.8	99		99	99	999	1015	28.7	28.6	23.8	99
2019	12	15	17	20	117	8.7	10.2	19.8	99		99	99	999	1015	28.7	28.6	23.7	99
2019	12	15	17	30	117	8.5	10.7	20.8	99		99	99	999	1015	28.7	28.6	23.8	99
2019	12	15	17	40	113	8.2	10	19.4	1.96	6.4	6.7	5.5	97	1015	28.6	28.6	23.8	99
2019	12	15	17	50	113	8.3	10.3	20.0	99		99	99	999	1015	28.6	28.6	23.9	99
2019	12	15	18	0	110	8.6	10.5	20.4	99		99	99	999	1014	28.6	28.6	24	99
2019	12	15	18	10	103	8.4	10.5	20.4	99		99	99	999	1014	28.6	28.6	24.3	99
2019	12	15	18	20	100	8.5	10.2	19.8	99		99	99	999	1014	28.2	28.6	24.4	99
2019	12	15	18	30	106	8.4	11.1	21.6	99		99	99	999	1014	27.9	28.6	24.2	99
2019	12	15	18	40	109	8.9	12.4	24.1	1.98	6.5	7.1	5.6	98	1014	27.7	28.6	23.8	99
2019	12	15	18	50	99	8.7	11.2	21.8	99		99	99	999	1014	27.2	28.6	23.2	99
2019	12	15	19	0	100	7	8.5	16.5	99		99	99	999	1014	27.3	28.6	23.5	99
2019	12	15	19	10	102	7.4	9.2	17.9	99		99	99	999	1014	28	28.6	23.7	99
2019	12	15	19	20	100	7.7	9.8	19.0	99		99	99	999	1014	28.2	28.6	24.2	99
2019	12	15	19	30	102	6.9	8.3	16.1	99		99	99	999	1014	28	28.6	24.3	99
2019	12	15	19	40	102	7.2	12.7	24.7	1.82	6.0	6.7	5.4	86	1014	28.2	28.6	24.7	99
2019	12	15	19	50	85	9.7	12.2	23.7	99		99	99	999	1014	27.1	28.6	23.7	99
2019	12	15	20	0	95	7.6	10.4	20.2	99		99	99	999	1014	27.5	28.6	23.7	99
2019	12	15	20	10	104	8.8	11.1	21.6	99		99	99	999	1014	28.5	28.6	24	99
2019	12	15	20	20	103	9	11.8	22.9	99		99	99	999	1014	28.5	28.6	24.2	99
2019	12	15	20	30	106	9.7	11.8	22.9	99		99	99	999	1014	28.6	28.6	24	99

#YY	MM	DD	hh	mm	WDIR	WSP	D GST	Knots Conver	WVHT	Feet	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS
#yr	mo	dy	hr	mn	degT	m/s	m/s	Conver	m	Conve	sec	sec	deg	T hPa	degC	degC	degC	mi

2019	12	15	20	40	102	8.7	10.7	20.8	1.86	6.1	5.9	5.4	106	1014	28.6	28.6	24.4	99
2019	12	15	20	50	102	8.6	11	21.4	99		99	99	999	1014	28.5	28.6	24.7	99
2019	12	15	21	0	104	8.5	10.3	20.0	99		99	99	999	1014	28.3	28.6	24.7	99
2019	12	15	21	10	103	7.8	9.6	18.7	99		99	99	999	1014	28.3	28.6	24.7	99
2019	12	15	21	20	103	7.9	10	19.4	99		99	99	999	1014	28.2	28.6	24.6	99
2019	12	15	21	30	102	7.5	9.5	18.5	99		99	99	999	1014	28.2	28.6	24.7	99
2019	12	15	21	40	103	7.6	9.9	19.2	1.94	6.4	7.1	5.6	94	1014	28.3	28.6	24.9	99
2019	12	15	21	50	99	8.7	10.8	21.0	99		99	99	999	1014	28.4	28.6	24.4	99
2019	12	15	22	0	102	8.6	10.8	21.0	99		99	99	999	1014	28.4	28.6	24.3	99
2019	12	15	22	10	98	8.7	10.8	21.0	99		99	99	999	1014	28.4	28.6	24.4	99
2019	12	15	22	20	98	9.2	11.2	21.8	99		99	99	999	1014	28.4	28.6	24.2	99
2019	12	15	22	30	96	8.6	10.3	20.0	99		99	99	999	1014	28.5	28.6	24.4	99
2019	12	15	22	40	96	8.8	10.9	21.2	1.74	5.7	7.1	5.4	106	1014	28.4	28.6	24.2	99
2019	12	15	22	50	96	8.2	10	19.4	99		99	99	999	1014	28.5	28.6	24.3	99
2019	12	15	23	0	93	8.6	10.2	19.8	99		99	99	999	1014	28.4	28.6	24.2	99
2019	12	15	23	10	93	8.1	9.9	19.2	99		99	99	999	1015	28.4	28.6	24.4	99
2019	12	15	23	20	90	8	9.8	19.0	99		99	99	999	1015	28.3	28.6	24.3	99
2019	12	15	23	30	92	7.8	9.4	18.3	99		99	99	999	1015	28.3	28.6	24.4	99
2019	12	15	23	40	94	8.2	10	19.4	1.86	6.1	7.1	5.5	98	1015	28.4	28.6	24.4	99
2019	12	15	23	50	97	8.5	10.1	19.6	99		99	99	999	1015	28.3	28.6	24.2	99
2019	12	16	0	0	94	7.8	9.3	18.1	99		99	99	999	1015	28.4	28.6	24.4	99
2019	12	16	0	10	91	8.4	10.3	20.0	99		99	99	999	1015	28.3	28.6	24.4	99
2019	12	16	0	20	90	8.3	10.3	20.0	99		99	99	999	1015	28.4	28.6	24.3	99
2019	12	16	0	30	90	9.1	10.8	21.0	99		99	99	999	1015	28.3	28.6	24.2	99
2019	12	16	0	40	91	8.3	10.4	20.2	1.87	6.1	7.1	5.4	98	1016	28.4	28.6	24.3	99
2019	12	16	0	50	90	8.8	10.7	20.8	99		99	99	999	1016	28.3	28.6	24	99
2019	12	16	1	0	93	8.5	10.8	21.0	99		99	99	999	1016	28.4	28.6	23.9	99
2019	12	16	1	10	92	8.3	10.4	20.2	99		99	99	999	1016	28.4	28.6	24.1	99
2019	12	16	1	20	91	8.6	10.6	20.6	99		99	99	999	1016	28.3	28.6	23.9	99
2019	12	16	1	30	91	8.7	10.8	21.0	99		99	99	999	1016	28.4	28.6	23.7	99
2019	12	16	1	40	91	8.5	10.1	19.6	2.04	6.7	6.7	5.4	96	1016	28.4	28.6	23.9	99
2019	12	16	1	50	88	8.9	10.7	20.8	99		99	99	999	1016	28.4	28.6	23.9	99
2019	12	16	2	0	86	9.3	11.5	22.4	99		99	99	999	1016	28.3	28.6	23.7	99
2019	12	16	2	10	89	8.9	10.8	21.0	99		99	99	999	1016	28.4	28.6	23.6	99
2019	12	16	2	20	88	9.1	11.3	22.0	99		99	99	999	1016	28.4	28.6	23.6	99
2019	12	16	2	30	89	9	10.8	21.0	99		99	99	999	1016	28.4	28.6	23.4	99
2019	12	16	2	40	87	8.7	10.8	21.0	1.96	6.4	7.7	5.4	100	1016	28.4	28.6	23.8	99
2019	12	16	2	50	88	9.2	11.8	22.9	99		99	99	999	1016	28.5	28.6	23.8	99
2019	12	16	3	0	88	9.9	12.1	23.5	99		99	99	999	1016	28.3	28.5	23.7	99

#YY	MM	DD	hh	mm	WDIR	WSP	D GST	Knots Conver	WVHT	Feet	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS
2019	12	16	3	10	89	9.8	11.7	22.7	99		99	99	999	1016	28.4	28.6	23.3	99
2019	12	16	3	20	92	9.3	11.3	22.0	99		99	99	999	1016	28.5	28.6	23.5	99
2019	12	16	3	30	97	9.3	11.2	21.8	99		99	99	999	1016	28.4	28.6	23.8	99
2019	12	16	3	40	97	9.3	11.3	22.0	1.86	6.1	7.7	5.3	106	1016	28.3	28.6	23.8	99
2019	12	16	3	50	93	8.9	10.8	21.0	99		99	99	999	1016	28.3	28.6	24	99
2019	12	16	4	0	95	9.6	11.6	22.5	99		99	99	999	1016	28.3	28.6	23.5	99

#YY	MM	DD	hh	mm	WDIR	WSP	D GST m/s	Knots Conver	WVHT	Feet	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS
#yr	mo	dy	hr	mn	degT	m/s	m/s		m	Conve	sec	sec	deg	T hPa	degC	degC	degC	mi
2019	12	16	4	10	97	9.4	11.5	22.4	99		99	99	999	1016	28.4	28.6	23.5	99
2019	12	16	4	20	94	9.3	11.1	21.6	99		99	99	999	1016	28.3	28.6	23.8	99
2019	12	16	4	30	96	9	11.2	21.8	99		99	99	999	1016	28.3	28.6	24.2	99
2019	12	16	4	40	94	9.6	11.9	23.1	1.99	6.5	7.7	5.4	91	1016	28.2	28.6	24.4	99
2019	12	16	4	50	90	9.9	12	23.3	99		99	99	999	1016	28.2	28.5	24.1	99
2019	12	16	5	0	93	9.8	12.8	24.9	99		99	99	999	1016	28.2	28.6	23.9	99
2019	12	16	5	10	90	9.7	12.8	24.9	99		99	99	999	1016	28.3	28.6	23.9	99
2019	12	16	5	20	87	9.3	11.1	21.6	99		99	99	999	1016	28.2	28.6	23.9	99
2019	12	16	5	30	89	8.8	10.8	21.0	99		99	99	999	1016	28.2	28.6	24	99
2019	12	16	5	40	89	9.2	11.7	22.7	2.14	7.0	7.1	5.6	96	1015	28.2	28.6	24.1	99
2019	12	16	5	50	89	8.9	11.1	21.6	99		99	99	999	1015	28.2	28.6	24.1	99
2019	12	16	6	0	90	8.8	11.1	21.6	99		99	99	999	1015	28.2	28.6	24.2	99
2019	12	16	6	10	100	9.7	13.5	26.2	99		99	99	999	1015	27.6	28.6	23.8	99
2019	12	16	6	20	113	8.1	11.1	21.6	99		99	99	999	1015	27.1	28.6	23.3	99
2019	12	16	6	30	109	7.2	8.9	17.3	99		99	99	999	1015	27.4	28.6	23.7	99
2019	12	16	6	40	96	7.8	11.5	22.4	2.03	6.7	6.7	5.6	100	1015	27.7	28.6	24	99
2019	12	16	6	50	89	9.6	12.3	23.9	99		99	99	999	1014	28	28.6	23.7	99
2019	12	16	7	0	89	9.6	12.1	23.5	99		99	99	999	1014	28.2	28.6	23.6	99
2019	12	16	7	10	90	9.4	11.7	22.7	99		99	99	999	1014	28.2	28.6	23.8	99
2019	12	16	7	20	89	9.7	11.6	22.5	99		99	99	999	1014	28.1	28.6	23.7	99
2019	12	16	7	30	91	9.1	11.2	21.8	99		99	99	999	1014	28.2	28.6	23.9	99
2019	12	16	7	40	90	9.4	11.3	22.0	2.17	7.1	7.1	5.7	91	1014	28.1	28.6	23.6	99
2019	12	16	7	50	86	9.2	11.3	22.5	99		99	99	999	1014	28.1	28.6	24.1	99
2019	12	16	8	0	91	9.3	11.6	21.8	99		99	99	999	1014	28	28.6	23.7	99
2019	12	16	8	10	92	9	11.2	21.6	99		99	99	999	1014	28	28.6	23.9	99
2019	12	16	8	20	86	8.7	11.1	22.9	99		99	99	999	1014	28	28.6	24.3	99
2019	12	16	8	30	79	9.2	11.8	22.4	99		99	99	999	1014	27.7	28.6	24.5	99
2019	12	16	8	40	77	9.3	11.5	23.3	2.11	6.9	7.1	5.6	88	1014	27.7	28.6	24.5	99
2019	12	16	8	50	80	9.6	12	23.9	99		99	99	999	1014	27.8	28.6	24.2	99
2019	12	16	9	0	80	10.2	12.3	28.8	99		99	99	999	1014	27.9	28.6	24.1	99

#YY	MM	DD	hh	mm	WDIR	WSP	D GST	Knots	WVHT	Feet	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS
#yr	mo	dy	hr	mn	degT	m/s	m/s	Conver	m	Conve	sec	sec	deg	T hPa	degC	degC	degC	mi
2019	12	16	9	10	81	10.2	14.8	25.5	99		99	99	999	1015	27.9	28.6	24.2	99
2019	12	16	9	20	81	10.2	13.1	23.1	99		99	99	999	1015	27.5	28.6	23.9	99
2019	12	16	9	30	83	9.4	11.9	21.6	99		99	99	999	1015	27.4	28.6	23.6	99
2019	12	16	9	40	83	8.4	11.1	23.7	2.2	7.2	6.7	5.6	94	1015	27.5	28.6	23.9	99
2019	12	16	9	50	87	9.3	12.2	24.7	99		99	99	999	1015	27.7	28.6	24.1	99
2019	12	16	10	0	87	10.3	12.7	23.3	99		99	99	999	1015	27.9	28.5	23.9	99
2019	12	16	10	10	87	10.1	12	24.5	99		99	99	999	1015	28	28.6	24.1	99
2019	12	16	10	20	83	10.1	12.6	24.3	99		99	99	999	1015	28	28.6	24.3	99
2019	12	16	10	30	91	10.4	12.5	22.5	99		99	99	999	1015	27.9	28.6	23.9	99
2019	12	16	10	40	87	9.7	11.6	23.7	2.27	7.4	7.7	5.7	89	1015	28	28.5	24.2	99
2019	12	16	10	50	88	9.7	12.2	28.8	99		99	99	999	1015	27.9	28.6	24.1	99
2019	12	16	11	0	89	10.5	14.8		99		99	99	999	1015	28	28.6	24	99
2019	12	16	11	10	99	12	17.6	34.2	99		99	99	999	1016	26.6	28.5	22.5	99
2019	12	16	11	20	93	7.8	9.8	19.0	99		99	99	999	1016	26.6	28.6	21.8	99
2019	12	16	11	30	89	8.3	10.1	19.6	99		99	99	999	1016	27.9	28.6	22.2	99
2019	12	16	11	40	87	9.5	12.1	23.5	2.17	7.1	7.1	5.6	95	1016	28.1	28.6	23.7	99
2019	12	16	11	50	93	9	11.1	21.6	99		99	99	999	1016	28	28.6	24.2	99
2019	12	16	12	0	92	8.8	11	21.4	99		99	99	999	1016	28.1	28.6	24	99
2019	12	16	12	10	84	9.2	11.9	23.1	99		99	99	999	1016	28.1	28.5	24	99
2019	12	16	12	20	82	9.8	12.2	23.7	99		99	99	999	1016	28.2	28.5	23.9	99
2019	12	16	12	30	82	9.9	12.5	24.3	99		99	99	999	1016	28.3	28.5	23.9	99
2019	12	16	12	40	82	9.9	11.6	22.5	2.07	6.8	6.7	5.5	94	1017	28.3	28.5	23.8	99
2019	12	16	12	50	82	10.1	12.4	24.1	99		99	99	999	1017	28.3	28.5	23.6	99
2019	12	16	13	0	85	9.9	12.7	24.7	99		99	99	999	1017	28.3	28.5	23.6	99
2019	12	16	13	10	81	10.1	12.1	23.5	99		99	99	999	1017	28.3	28.5	23.3	99
2019	12	16	13	20	83	10.2	12.4	24.1	99		99	99	999	1017	28.3	28.5	23.3	99
2019	12	16	13	30	83	9.9	12	23.3	99		99	99	999	1017	28.3	28.5	23.4	99
2019	12	16	13	40	80	9.9	12	23.3	2.22	7.3	6.7	5.6	80	1017	28.3	28.5	23.5	99
2019	12	16	13	50	79	9.5	11.3	22.0	99		99	99	999	1017	28.3	28.5	23.6	99
2019	12	16	14	0	82	9.6	11.4	22.2	99		99	99	999	1017	28.3	28.5	23.4	99
2019	12	16	14	10	81	9.4	11.5	22.4	99		99	99	999	1017	28.4	28.6	23.4	99
2019	12	16	14	20	85	9.3	11.7	22.7	99		99	99	999	1017	28.3	28.6	23.6	99
2019	12	16	14	30	86	9.2	11.6	22.5	99		99	99	999	1017	28.3	28.6	23.5	99
2019	12	16	14	40	82	9.2	11.8	22.9	2.08	6.8	7.1	5.7	75	1017	28.3	28.6	23.7	99
2019	12	16	14	50	84	9.4	11.5	22.4	99		99	99	999	1017	28.3	28.6	23.5	99
2019	12	16	15	0	83	9.1	11.1	21.6	99		99	99	999	1017	28.3	28.6	23.5	99

#YY	MM	DD	hh	mm	WDIR	WSP	D GST	Knots	WVHT	Feet	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS
#yr	mo	dy	hr	mn	degT	m/s	m/s	Conver	m	Conve	sec	sec	deg	T hPa	degC	degC	degC	mi
2019	12	16	15	10	87	9.3	11	22.5	99		99	99	999	1016	28.3	28.6	23.3	99
2019	12	16	15	20	92	9.4	11.4	22.9	99		99	99	999	1016	28.4	28.6	23.2	99
2019	12	16	15	30	87	9	11.6	23.3	99		99	99	999	1016	28.4	28.6	23.5	99
2019	12	16	15	40	86	9.2	11.8	21.6	2.14	7.0	7.7	5.7	96	1016	28.3	28.6	23.6	99
2019	12	16	15	50	86	9.4	12	22.0	99		99	99	999	1016	28.3	28.6	23.3	99
2019	12	16	16	0	92	9.2	11.1	20.0	99		99	99	999	1016	28.5	28.6	23.5	99
2019	12	16	16	10	92	8.7	11.3	22.2	99		99	99	999	1016	28.4	28.6	23.7	99
2019	12	16	16	20	93	8.3	10.3	21.8	99		99	99	999	1016	28.4	28.6	23.9	99
2019	12	16	16	30	87	9.1	11.4	21.0	99		99	99	999	1016	28.3	28.6	23.7	99
2019	12	16	16	40	90	9.2	11.2	22.2	2.04	6.7	7.7	5.7	82	1015	28.4	28.6	23.6	99
2019	12	16	16	50	94	9	10.8	20.8	99		99	99	999	1015	28.4	28.6	23.6	99
2019	12	16	17	0	90	9.2	11.4	22.9	99		99	99	999	1015	28.3	28.6	23.2	99
2019	12	16	17	10	91	9.2	10.7	22.2	99		99	99	999	1015	28.4	28.6	23.3	99
2019	12	16	17	20	94	9.1	11.8	21.0	99		99	99	999	1015	28.4	28.6	23.2	99
2019	12	16	17	30	89	8.8	11.4	21.0	99		99	99	999	1015	28.3	28.6	23.5	99
2019	12	16	17	40	90	8.9	10.8	21.4	2.29	7.5	7.1	5.7	76	1014	28.2	28.6	23.4	99
2019	12	16	17	50	92	8.8	10.8	22.7	99		99	99	999	1014	28.3	28.6	23.6	99
2019	12	16	18	0	91	8.9	11	21.0	99		99	99	999	1014	28.2	28.6	23.4	99
2019	12	16	18	10	93	9.3	11.7	21.4	99		99	99	999	1014	28.3	28.6	23.4	99
2019	12	16	18	20	93	9	10.8	21.6	99		99	99	999	1014	28.3	28.6	23.4	99
2019	12	16	18	30	84	9.1	11	20.0	99		99	99	999	1014	28.1	28.6	23.7	
2019	12	16	18	40	81	9.2	11.1	22.4	2.21	7.3	7.7	5.6	85	1014	27.9	28.6	23.8	99
2019	12	16	18	50	81	8.6	10.3		99		99	99	999	1014	28	28.6	23.5	99
2019	12	16	19	0	86	9.2	11.5		99		99	99	999	1014	28	28.6	23.7	99
2019	12	16	19	10	86	8.4	10.8	21.0	99		99	99	999	1014	28.1	28.6	24.1	99
2019	12	16	19	20	91	8.7	10.6	20.6	99		99	99	999	1013	28.1	28.6	24	99
2019	12	16	19	30	86	9.2	12.1	23.5	99		99	99	999	1014	28.1	28.6	24.1	99
2019	12	16	19	40	81	10.1	12.5	24.3	2.22	7.3	6.7	5.7	87	1013	27.6	28.6	23.6	99
2019	12	16	19	50	86	9.9	12.2	23.7	99		99	99	999	1013	27.9	28.6	23.6	99
2019	12	16	20	0	91	9.9	12.1	23.5	99		99	99	999	1013	27.7	28.6	23.8	99
2019	12	16	20	10	89	9.2	11.8	22.9	99		99	99	999	1013	27.6	28.6	23.3	99
2019	12	16	20	20	91	8.8	10.8	21.0	99		99	99	999	1013	27.9	28.6	23.4	99
2019	12	16	20	30	93	8.7	11	21.4	99		99	99	999	1013	27.9	28.6	23.5	99
2019	12	16	20	40	92	9.5	11.8	22.9	2.02	6.6	7.7	5.7	80	1013	28.1	28.6	23.7	99
2019	12	16	20	50	88	9.5	11.7	22.7	99		99	99	999	1013	28	28.6	23.9	99
2019	12	16	21	0	88	9	11.2	21.8	99		99	99	999	1013	27.7	28.6	23.3	99

| #YY | MM | DD | hh | mm | WDIR | WSP | D GST | Knots Conver | WVHT | Feet | DPD | APD | MWD | PRES | ATMP | WTMP | DEWP | VIS |
#yr	mo	dy	hr	mn	degT	m/s	m/s		m	Conve	sec	sec	deg	T hPa	degC	degC	degC	mi
2019	12	16	21	10	84	8.3	10	19.4	99		99	99	999	1013	27.9	28.6	23.1	99
2019	12	16	21	20	84	7.8	10.2	19.8	99		99	99	999	1013	28	28.6	23.7	99
2019	12	16	21	30	82	7.6	9.7	18.9	99		99	99	999	1013	28	28.6	24.1	99
2019	12	16	21	40	86	7.7	11	21.4	2.04	6.7	7.1	5.7	94	1013	28	28.6	24.2	99
2019	12	16	21	50	88	8.9	11.5	22.4	99		99	99	999	1013	28.2	28.6	23.8	99
2019	12	16	22	0	87	9	11.4	22.2	99		99	99	999	1013	28.2	28.6	23.6	99
2019	12	16	22	10	88	9.3	12.3	23.9	99		99	99	999	1013	28.2	28.6	23.4	99
2019	12	16	22	20	90	9.5	11.5	22.4	99		99	99	999	1013	28.2	28.6	23.4	99
2019	12	16	22	30	85	9.2	11	21.4	99		99	99	999	1013	28.2	28.6	23.4	99
2019	12	16	22	40	82	8.7	10.6	20.6	1.9	6.2	7.7	5.5	91	1013	28.3	28.6	23.8	99
2019	12	16	22	50	84	9.1	11.1	21.6	99		99	99	999	1013	28.2	28.6	23.7	99
2019	12	16	23	0	83	9.1	11.2	21.8	99		99	99	999	1013	28.2	28.6	23.7	99
2019	12	16	23	10	82	9.3	12.1	23.5	99		99	99	999	1013	28.2	28.6	23.9	99
2019	12	16	23	20	80	9	11.1	21.6	99		99	99	999	1014	28.2	28.6	23.8	99
2019	12	16	23	30	83	9.5	11.8	22.9	99		99	99	999	1014	28.2	28.6	23.5	99
2019	12	16	23	40	85	9.1	10.7	20.8	2.07	6.8	7.1	5.6	84	1014	28.2	28.6	23.7	99
2019	12	16	23	50	85	8.9	10.7	20.8	99		99	99	999	1014	28.2	28.6	23.7	99
2019	12	17	0	0	83	8.8	10.8	21.0	99		99	99	999	1014	28.1	28.6	23.7	99
2019	12	17	0	10	84	9.3	11.2	21.8	99		99	99	999	1014	28.1	28.6	23.7	99
2019	12	17	0	20	85	9.1	11.2	21.8	99		99	99	999	1014	28.1	28.6	23.7	99
2019	12	17	0	30	85	9	11.4	22.2	99		99	99	999	1014	28.2	28.6	23.7	99
2019	12	17	0	40	82	9.2	10.9	21.2	2.05	6.7	7.1	5.6	87	1014	28	28.6	23.8	99
2019	12	17	0	50	81	9.1	11.1	21.6	99		99	99	999	1015	28	28.6	23.9	99
2019	12	17	1	0	80	9.3	11.7	22.7	99		99	99	999	1015	27.9	28.6	23.8	99
2019	12	17	1	10	82	9.2	11.3	22.0	99		99	99	999	1015	27.9	28.6	23.9	99
2019	12	17	1	20	83	9.8	11.7	22.7	99		99	99	999	1015	27.9	28.6	23.9	99
2019	12	17	1	30	83	9.4	11.7	22.7	99		99	99	999	1015	28	28.6	24.1	99
2019	12	17	1	40	81	9.6	11.6	22.5	2.12	7.0	7.1	5.6	75	1015	28	28.6	23.9	99
2019	12	17	1	50	83	9.8	12.2	23.7	99		99	99	999	1015	28	28.6	23.9	99
2019	12	17	2	0	86	9.4	11.6	22.5	99		99	99	999	1015	28.1	28.6	24	99
2019	12	17	2	10	91	9.2	12.3	23.9	99		99	99	999	1015	28	28.6	23.8	99
2019	12	17	2	20	84	9.1	11.8	22.9	99		99	99	999	1015	28.1	28.6	24.4	99
2019	12	17	2	30	89	10.2	12.5	24.3	99		99	99	999	1015	28	28.6	23.9	99
2019	12	17	2	40	87	10.2	12.2	23.7	1.97	6.5	6.7	5.4	83	1015	28.1	28.6	23.7	99
2019	12	17	2	50	89	9.1	11.2	21.8	99		99	99	999	1015	28	28.6	24	99
2019	12	17	3	0	90	9.1	11.3	22.0	99		99	99	999	1015	28.1	28.6	24.1	99

2019	12	17	3	10	92	9.4	11.7	22.7	99		99	99	999	1015	28.1	28.6	23.8	99
2019	12	17	3	20	83	9.2	11.4	22.2	99		99	99	999	1015	27.8	28.6	24.5	99
2019	12	17	3	30	83	9.2	11.6	22.5	99		99	99	999	1015	27.6	28.6	24.3	99
2019	12	17	3	40	88	9.6	11.9	23.1	2.01	6.6	7.1	5.5	90	1014	27.6	28.6	24.2	99
2019	12	17	3	50	87	9.8	12.2	23.7	99		99	99	999	1014	27.7	28.6	24.3	99
2019	12	17	4	0	90	9.8	12.5	24.3	99		99	99	999	1014	27.8	28.6	24.2	99
2019	12	17	4	10	92	10	12.4	24.1	99		99	99	999	1014	27.9	28.5	23.6	99
2019	12	17	4	20	93	9.8	11.8	22.9	99		99	99	999	1014	28	28.6	23.7	99
2019	12	17	4	30	92	9.2	12	23.3	99		99	99	999	1014	28	28.5	23.9	99
2019	12	17	4	40	94	9.9	12.4	24.1	2.21	7.3	7.1	5.7	88	1014	28	28.5	23.5	99
2019	12	17	4	50	92	9.6	12.6	24.5	99		99	99	999	1014	28	28.5	23.8	99
2019	12	17	5	0	89	9.8	12.8	24.9	99		99	99	999	1014	27.8	28.6	23.5	99
2019	12	17	5	10	92	9.8	12	23.3	99		99	99	999	1014	27.6	28.6	23.6	99
2019	12	17	5	20	93	9.9	12	23.3	99		99	99	999	1014	27.7	28.5	23.8	99
2019	12	17	5	30	90	9.5	11.7	22.7	99		99	99	999	1014	27.7	28.5	24	99
2019	12	17	5	40	91	9.4	11.1	21.6	2.12	7.0	7.7	5.6	98	1014	27.8	28.6	23.9	99
2019	12	17	5	50	98	9.5	12.1	23.5	99		99	99	999	1013	27.9	28.6	23.8	99
2019	12	17	6	0	95	9.2	11.4	22.2	99		99	99	999	1013	27.9	28.6	23.8	99
2019	12	17	6	10	91	9.4	11.6	22.5	99		99	99	999	1013	27.9	28.6	23.9	99
2019	12	17	6	20	88	9.4	11.5	22.4	99		99	99	999	1013	27.8	28.6	23.9	
2019	12	17	6	30	83	8.7	10.5	20.4	99		99	99	999	1013	27.5	28.5	23.9	99
2019	12	17	6	40	87	8.2	10.3	20.0	2.3	7.5	7.1	5.6	79	1013	27.6	28.5	24	
2019	12	17	6	50	86	9	10.6	20.6	99		99	99	999	1013	27.5	28.6	23.7	99
2019	12	17	7	0	88	8.1	10.1	19.6	99		99	99	999	1012	27.5	28.5	23.9	99
2019	12	17	7	10	93	8.2	12	23.3	99		99	99	999	1012	26.7	28.5	23.7	99
2019	12	17	7	20	77	8.9	11.3	22.0	99		99	99	999	1012	26.7	28.5	23.8	99
2019	12	17	7	30	73	8.1	10.3	20.0	99		99	99	999	1012	26.6	28.6	23.6	99
2019	12	17	7	40	79	7.5	9.5	18.5	2.09	6.9	7.7	5.5	93	1012	26.9	28.5	23.9	99
2019	12	17	7	50	91	7.8	10.4	20.2	99		99	99	999	1012	27.2	28.5	24.1	99
2019	12	17	8	0	102	8.9	10.7	20.8	99		99	99	999	1012	27.6	28.5	23.8	99
2019	12	17	8	10	99	8.7	10.6	20.6	99		99	99	999	1012	27.6	28.5	23.8	99
2019	12	17	8	20	100	8.9	11.3	22.0	99		99	99	999	1012	27.6	28.5	23.6	99
2019	12	17	8	30	99	9	11.2	21.8	99		99	99	999	1012	27.7	28.5	23.6	99
2019	12	17	8	40	98	8.9	11.2	21.8	2.12	7.0	7.1	5.7	94	1012	27.7	28.5	23.6	
2019	12	17	8	50	102	8.6	10.6	20.6	99		99	99	999	1012	27.7	28.6	23.8	99
2019	12	17	9	0	103	9.2	11.4	22.2	99		99	99	999	1012	27.7	28.5	23.6	99
2019	12	17	9	10	104	9.1	12.2	23.7	99		99	99	999	1012	27.8	28.5	23.7	99
2019	12	17	9	20	105	9.3	11.6	22.5	99		99	99	999	1012	27.8	28.5	23.3	99
2019	12	17	9	30	102	8.8	10.8	21.0	99		99	99	999	1013	27.9	28.5	23.5	99

2019	12	17	9	40	97	8.3	10.2	19.8	2.13	7.0	7.7	5.8	97	1013	27.8	28.5	23.6	99
2019	12	17	9	50	97	8.7	11	21.4	99		99	99	999	1013	27.9	28.5	23.9	99
2019	12	17	10	0	107	10	12.8	24.9	99		99	99	999	1013	27.9	28.5	23.2	99

#YY	MM	DD	hh	mm	WDIR	WSP	D GST	Knots	WVHT	Feet	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS
#yr	mo	dy	hr	mn	degT	m/s	m/s	Conver	m	Conve	sec	sec	deg	T hPa	degC	degC	degC	mi
2019	12	17	10	10	106	9	11.7	22.7	99		99	99	999	1013	27.9	28.5	23.6	99
2019	12	17	10	20	101	8.8	11.3	22.0	99		99	99	999	1013	27.7	28.5	24.2	99
2019	12	17	10	30	101	8.6	10.5	20.4	99		99	99	999	1013	27.5	28.5	23.8	99
2019	12	17	10	40	106	8.4	11	21.4	2.28	7.5	7.1	5.8	77	1013	27.7	28.5	23.5	99
2019	12	17	10	50	105	8.7	10.6	20.6	99		99	99	999	1013	27.8	28.5	23.7	99
2019	12	17	11	0	108	8.4	10.6	20.6	99		99	99	999	1013	27.8	28.5	23.8	99
2019	12	17	11	10	107	8.2	10.1	19.6	99		99	99	999	1013	27.9	28.5	23.9	99
2019	12	17	11	20	102	8.2	10.5	20.4	99		99	99	999	1014	28	28.5	23.9	99
2019	12	17	11	30	94	9.9	14	27.2	99		99	99	999	1014	27.7	28.5	23.5	99
2019	12	17	11	40	86	8.7	10.6	20.6	2.13	7.0	7.1	5.9	87	1014	27.1	28.5	23.3	99
2019	12	17	11	50	94	8	10.4	20.2	99		99	99	999	1014	27.7	28.5	23.6	99
2019	12	17	12	0	102	8.7	11.2	21.8	99		99	99	999	1014	27.9	28.5	23.9	99
2019	12	17	12	10	104	8.9	11	21.4	99		99	99	999	1014	28	28.5	23.9	99
2019	12	17	12	20	103	8.8	10.9	21.2	99		99	99	999	1014	28.1	28.5	24	99
2019	12	17	12	30	100	9.3	11.2	21.8	99		99	99	999	1014	28.1	28.5	24.1	99
2019	12	17	12	40	104	11.1	15.5	30.1	2.04	6.7	7.7	5.7	79	1014	27.5	28.5	23.8	99
2019	12	17	12	50	108	9.8	11.8	22.9	99		99	99	999	1014	27.1	28.5	23.1	99
2019	12	17	13	0	112	9.5	12.1	23.5	99		99	99	999	1015	28.1	28.5	22.9	99
2019	12	17	13	10	109	9.9	13.2	25.7	99		99	99	999	1015	28.3	28.5	22.9	99
2019	12	17	13	20	104	9.9	11.8	22.9	99		99	99	999	1015	28.2	28.5	23.3	99
2019	12	17	13	30	99	8.9	11	21.4	99		99	99	999	1015	28.2	28.5	23.5	99
2019	12	17	13	40	104	8.6	11.6	22.5	2.05	6.7	7.7	5.5	64	1015	28.3	28.5	24.1	99
2019	12	17	13	50	99	8.8	10.7	20.8	99		99	99	999	1015	28.2	28.5	24.1	99
2019	12	17	14	0	99	8.3	10	19.4	99		99	99	999	1015	28.2	28.5	24.3	99
2019	12	17	14	10	99	8.9	10.7	20.8	99		99	99	999	1015	28.2	28.5	24.1	99
2019	12	17	14	20	99	8.5	10.8	21.0	99		99	99	999	1015	28.3	28.5	24.1	99
2019	12	17	14	30	106	9	11.5	22.4	99		99	99	999	1015	28.3	28.6	24.2	99
2019	12	17	14	40	109	9.2	11.2	21.8	2.35	7.7	7.1	6	85	1015	28.4	28.6	24	99
2019	12	17	14	50	109	9.1	11.2	21.8	99		99	99	999	1014	28.5	28.6	24.1	99
2019	12	17	15	0	106	10.1	13.8	26.8	99		99	99	999	1015	28.2	28.6	24.1	99
2019	12	17	15	10	100	9.5	11.8	22.9	99		99	99	999	1014	27.6	28.6	23	99
2019	12	17	15	20	104	9.3	11.2	21.8	99		99	99	999	1014	27.9	28.6	23.3	99
2019	12	17	15	30	106	9.9	12.1	23.5	99		99	99	999	1014	28.1	28.6	23.8	99

#YY	MM	DD	hh	mm	WDIR	WSP	D GST	Knots Conver	WVHT	Feet	DPD	APD	MWD	PRES	ATMP	WTMP	DEWP	VIS
#yr	mo	dy	hr	mn	degT	m/s	m/s	Conver	m	Conve	sec	sec	deg	T hPa	degC	degC	degC	mi
2019	12	17	15	40	107	9.2	11.5	22.4	2.05	6.7	7.7	5.5	79	1014	28	28.6	23.7	99
2019	12	17	15	50	108	9.2	11.4	22.2	99		99	99	999	1014	28.2	28.6	23.5	99
2019	12	17	16	0	105	8.8	11.3	22.0	99		99	99	999	1014	28.1	28.6	23.9	99
2019	12	17	16	10	104	8.8	10.8	21.0	99		99	99	999	1014	28.2	28.6	24.1	99
2019	12	17	16	20	100	9	11.8	22.9	99		99	99	999	1013	28.1	28.6	24.3	99
2019	12	17	16	30	116	8.6	11.8	22.9	99		99	99	999	1013	28	28.6	24.2	99
2019	12	17	16	40	110	8.9	11.2	21.8	2.29	7.5	7.1	5.9	79	1013	28.2	28.6	24.4	99
2019	12	17	16	50	104	9.6	11.9	23.1	99		99	99	999	1013	28.3	28.6	24.2	99
2019	12	17	17	0	105	9.1	11.3	22.0	99		99	99	999	1013	28.4	28.6	24.1	99
2019	12	17	17	10	109	9.8	11.8	22.9	99		99	99	999	1013	28.3	28.6	23.7	99
2019	12	17	17	20	109	8.9	11.3	22.0	99		99	99	999	1013	28.5	28.6	24	99
2019	12	17	17	30	106	8.9	11.3	22.0	99		99	99	999	1013	28.3	28.6	23.9	99
2019	12	17	17	40	105	9	11	21.4	2.26	7.4	7.1	5.8	72	1012	28.4	28.6	24	99
2019	12	17	17	50	104	8.9	11.9	23.1	99		99	99	999	1012	28.4	28.6	24.3	99
2019	12	17	18	0	103	9.4	11.1	21.6	99		99	99	999	1012	28.3	28.6	24.1	99
2019	12	17	18	10	109	9.6	11.8	22.9	99		99	99	999	1012	28.3	28.6	24	99
2019	12	17	18	20	111	9.6	11.7	22.7	99		99	99	999	1012	28.3	28.6	24	99
2019	12	17	18	30	116	9.1	11.7	22.7	99		99	99	999	1012	28.2	28.6	24.3	99
2019	12	17	18	40	117	9.1	11.8	22.9	2.22	7.3	7.7	5.7	78	1012	28	28.6	23.6	99
2019	12	17	18	50	117	8.8	11	21.4	99		99	99	999	1012	28.3	28.6	23.9	99
2019	12	17	19	0	111	9.2	11.7	22.7	99		99	99	999	1012	28	28.6	23.9	99
2019	12	17	19	10	111	9	11.1	21.6	99		99	99	999	1012	28	28.6	23.7	99
2019	12	17	19	20	111	9.3	11.5	22.4	99		99	99	999	1012	28.2	28.6	23.6	99
2019	12	17	19	30	111	9.1	11.1	21.6	99		99	99	999	1011	28.3	28.6	23.9	99
2019	12	17	19	40	108	9.1	11.4	22.2	2.35	7.7	7.7	6	77	1011	28.2	28.6	24.2	99
2019	12	17	19	50	107	8.5	10.4	20.2	99		99	99	999	1011	27.9	28.6	24	99
2019	12	17	20	0	113	8.2	10.3	20.0	99		99	99	999	1011	28	28.6	24.2	99
2019	12	17	20	10	107	8.6	10.3	20.0	99		99	99	999	1011	28.1	28.6	24.3	99
2019	12	17	20	20	100	8.6	10.5	20.4	99		99	99	999	1011	28.1	28.6	24.4	99
2019	12	17	20	30	108	8.8	10.5	20.4	99		99	99	999	1011	28.1	28.6	24.3	99
2019	12	17	20	40	104	9.5	11.8	22.9	2.34	7.7	7.1	6	77	1011	28.2	28.6	24.4	99
2019	12	17	20	50	96	9.3	12	23.3	99		99	99	999	1011	27.9	28.6	24.7	99
2019	12	17	21	0	96	8.9	11.1	21.6	99		99	99	999	1011	27.8	28.6	24.3	99
2019	12	17	21	10	105	8.6	11	21.4	99		99	99	999	1011	28	28.6	24.3	99
2019	12	17	21	20	109	8.9	10.8	21.0	99		99	99	999	1012	28	28.6	24.3	99
2019	12	17	21	30	106	8.7	10.8	21.0	99		99	99	999	1012	28.2	28.6	24.4	99

#yr	mo	dy	hr	mn	WDIR degT	WSP m/s	D GST m/s	Knots Conver	WVHT m	Feet Conve	DPD sec	APD sec	MWD deg	PRES T hPa	ATMP degC	WTMP degC	DEWP degC	VIS mi
2019	12	17	21	40	109	8.6	11.6	25.5	2.3	7.5	7.7	5.9	83	1012	28.2	28.6	24.3	99
2019	12	17	21	50	119	9.3	11.3	25.5	99		99	99	999	1012	28.4	28.6	24	99
2019	12	17	22	0	121	9.2	11.4	23.9	99		99	99	999	1012	28.4	28.6	24	99
2019	12	17	22	10	115	9.7	13.1	23.5	99		99	99	999	1012	28.2	28.6	24	99
2019	12	17	22	20	107	10.2	13.1	23.7	99		99	99	999	1012	27.6	28.6	23.9	99
2019	12	17	22	30	110	9.8	12.3	22.7	99		99	99	999	1012	27.6	28.6	23.9	99
2019	12	17	22	40	117	9.8	12.1	22.5	2.52	8.3	7.7	6.1	80	1012	27.9	28.6	23.8	99
2019	12	17	22	50	113	9.5	12.2	22.9	99		99	99	999	1012	28.1	28.6	24	99
2019	12	17	23	0	111	9.4	11.7	24.7	99		99	99	999	1012	28	28.6	24	99
2019	12	17	23	10	111	9.5	11.6	26.4	99		99	99	999	1012	28.1	28.5	24	99
2019	12	17	23	20	108	9.4	11.8	24.7	99		99	99	999	1012	28.2	28.5	24.1	99
2019	12	17	23	30	109	9.8	12.7	24.7	99		99	99	999	1012	28.3	28.5	23.8	99
2019	12	17	23	40	108	0.8	13.6	25.7	2.3	7.5	7.7	5.9	85	1012	28.5	28.5	23.3	99
2019	12	17	23	50	109	0.2	12.7	23.9	99		99	99	999	1012	28.5	28.5	23.7	99
2019	12	18	0	0	112	0.3	12.7	23.3	99		99	99	999	1012	28.4	28.5	23.8	99
2019	12	18	0	10	108	0.3	13.2	22.0	99		99	99	999	1012	28.3	28.5	23.8	99
2019	12	18	0	20	111	9.8	12.3	24.5	99		99	99	999	1012	28.3	28.5	23.7	99
2019	12	18	0	30	110	9.6	12	24.7	99		99	99	999	1012	28.4	28.5	23.9	99
2019	12	18	0	40	115	9.5	11.3		2.34	7.7	7.1	6	98	1012	28.4	28.5	23.9	99
2019	12	18	0	50	111	0.1	12.6		99		99	99	999	1013	28.4	28.5	23.7	99
2019	12	18	1	0	109	0.2	12.7		99		99	99	999	1013	28.4	28.5	23.5	99

#YY #yr	MM mo	DD dy	hh hr	mm mn	WDIR degT	WSP m/s	D GST m/s	Knots Conver	WVHT m	Feet Conve	DPD sec	APD sec	MWD deg	PRES T hPa	ATMP degC	WTMP degC	DEWP degC	VIS mi
2019	12	18	1	10	109	9.5	11.5	22.4	99		99	99	999	1013	28.4	28.5	23.7	99
2019	12	18	1	20	112	9.5	11.9	23.1	99		99	99	999	1013	28.4	28.5	23.7	99
2019	12	18	1	30	105	0	12.1	23.5	99		99	99	999	1013	28.4	28.5	23.8	99
2019	12	18	1	40	112	9.7	12.3	23.9	2.67	8.8	7.1	6.2	95	1013	28.4	28.5	23.8	99
2019	12	18	1	50	113	0.1	12.4	24.1	99		99	99	999	1013	28.4	28.5	23.5	99
2019	12	18	2	0	113	0.4	12.3	23.9	99		99	99	999	1013	28.5	28.5	23.5	99
2019	12	18	2	10	111	9.4	11.5	22.4	99		99	99	999	1013	28.5	28.5	23.8	99
2019	12	18	2	20	116	9.8	12.2	23.7	99		99	99	999	1013	28.4	28.5	23.4	99
2019	12	18	2	30	116	0	12.4	24.1	99		99	99	999	1013	28.4	28.5	23.5	99
2019	12	18	2	40	113	0	13.1	25.5	2.5	8.2	7.1	6	104	1013	28.5	28.5	23.8	99
2019	12	18	2	50	110	9.4	12	23.3	99		99	99	999	1013	28.3	28.5	23.8	99
2019	12	18	3	0	111	9.8	11.9	23.1	99		99	99	999	1013	28.4	28.5	23.4	99
2019	12	18	3	10	110	9.6	11.8	22.9	99		99	99	999	1013	28.4	28.5	23.6	99
2019	12	18	3	20	113	9.5	11.8	22.9	99		99	99	999	1013	28.3	28.5	23.6	99
2019	12	18	3	40	115	9.5	12.1	23.5	99		99	99	999	1013	28.4	28.5	23.7	99

2019	12	18	3	50	115	9.9	12.2	25.7	99		99	99	999	1013	28.4	28.5	23.5	99
2019	12	18	4	0	105	9.3	13.2	21.4	99		99	99	999	1013	28.2	28.5	24.2	99
2019	12	18	4	10	109	9.2	11	24.9	99		99	99	999	1013	27.9	28.5	24.2	99
2019	12	18	4	20	112	9.7	12.8	23.5	99		99	99	999	1013	27.9	28.5	23.8	99
2019	12	18	4	30	113	9.9	12.1	24.3	99		99	99	999	1013	28.1	28.5	23.5	99
2019	12	18	4	40	114	9.9	12.5	24.1	2.35	7.7	7.7	5.8	92	1013	28	28.5	24.1	99
2019	12	18	4	50	113	9.7	12.4	24.1	99		99	99	999	1013	28.1	28.5	24.2	99
2019	12	18	5	0	101	9.3	12.4		99		99	99	999	1013	28	28.5	24.3	99